

# The Chemical Age

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**NOTICES:**—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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## Our Biggest Issue

THE present issue of THE CHEMICAL AGE—the annual Autumn Number—is the largest yet issued, alike in editorial and in advertising matter. This is no small achievement at what everyone trusts is the closing stage of one of the severest periods of depression known in chemical industry, and at a time when old-established contemporaries are exhibiting rather painful evidences of attrition. Once more, for such a result, must we pay our hearty acknowledgments to the loyalty of the numerous friends this journal has made at home and overseas. But our own success, we sincerely trust, has a hopeful significance for those whom THE CHEMICAL AGE seeks to serve. It may reasonably be taken to mean that we are on the eve of a genuine trade revival. For weeks past the signs have been increasingly favourable. Inquiries which were at a standstill are moving freely. Traders are already nibbling at business, like a patient with a slowly returning appetite. The turnover, it is true, is small so far, but the trickling tributaries now beginning to flow after an exceptional drought must presently merge in a strong current. The holiday season is on the point of ending, and when the staffs

are all back at work it is to be hoped that a steadily improving autumn trade will keep them busy to the end of the year.

The industry has borne the strain splendidly; what is most needed in the immediate future is a united effort by all parties to pull things round. Sir Alfred Mond, who is bringing sound business principles to bear in his administrative work, has said truly that what the country wants is more trade. The first condition is freedom from dispute and unrest, and a united devotion to industry such as that which is so rapidly restoring Belgian industrial fortunes. Fortunately there is a sense of greater stability on every side, and so general a belief and hope as that which now prevails that the tide of trade is turning is rarely doomed to disappointment.

## Sulphuric Acid Concentration

THE third volume of the special reports embodying the results of scientific and industrial value contained in the technical records of the Department of Explosives Supply deals with "Sulphuric Acid Concentration" (H.M. Stationery Office, 12s.). The closeness with which the present volume follows on the second, which dealt with the manufacture of TNT, shows that Mr. McNab, the editor, is making good progress with this important work, and the high standard of accuracy and fullness of detail which characterised the earlier volumes is equally notable here. The present volume consists of three sections, containing descriptions of the Gaillard and the Gilchrist concentration plants and the Cottrell precipitation plant. An account is given of the construction and operation of the Gaillard towers, together with a heat balance for this plant and the gas producers used in connexion with it. The working out of such a heat balance, it is remarked, necessitates a close study of the mechanism of sulphuric acid concentration, and affords an excellent example of physico-chemical knowledge as applied to plant operations. The Gilchrist plant is treated somewhat in the same manner, though not so fully, as the experience gained with this type of concentration unit is of a far more limited nature. The electrostatic treatment of sulphuric acid mist by the Cottrell precipitation plant is dealt with at some length in the concluding section and is followed in the appendix by a short treatment of the subject of free cross-section through coke filters.

In an introductory note the editor points out that in connexion with the nitration of organic bodies, whether for use as explosives or in the preparation of dyestuffs, the question of concentration of the sulphuric acid left in the spent acid resulting from their manufacture is of the greatest importance. After the spent acid has been denitrated there is left a dilute

sulphuric acid containing about 70 per cent. of  $H_2SO_4$ , and this has to be concentrated to 92 to 96 per cent. so that it can be profitably employed again in the process of nitration. Before the war the most successful plant was the Kessler type, which was constructed almost entirely of volvic stone obtained in France. When the Government had first to face the concentration of large quantities of spent acid it was impossible to get delivery of Kessler plant or to build Gaillard towers within the time available, so cascade concentration plants of silica or silicon ironware were erected. Many thousands of tons of acid were concentrated in these cascade plants. In several cases they were afterwards replaced by Gaillard towers. A study of the "Second Report on Costs and Efficiencies for H.M. Factories controlled by Factories Branch, D.E.S." shows very clearly the relative efficiencies and costs of running the various concentration plants in use. It must, however, be remembered that most of the plants were worked continuously to their extreme limit of output, and that necessarily led to higher charges for maintenance than would have been incurred under more normal and ideal conditions.

The extensive use that was made of the Gaillard towers during the war and the excellent results obtained have shown this to be one of the best methods for concentrating sulphuric acid, if not the best, which was tried: The cascade system consists of a series of small silica or silicon-iron basins set into the top of an inclined flue, and so placed that each basin delivers by a spout into the basin below. The flue is heated by gas or coke firing at the lowest or discharge end of the cascade, and the combustion gases pass up the flue and escape to the flue connecting with the chimney stack at the top of the cascade where the dilute acid enters the topmost basin. The acid is fed continually and passes from basin to basin, meeting hotter and hotter conditions and losing water as it passes down the cascade. The upper basins can be left open to the air, as only water vapour escapes, but as the acid becomes more concentrated and hotter in the lower basins, more and more fumes of sulphuric acid are given off and must be collected as far as possible, both to minimise loss of acid and avoid creating a nuisance. The lower basins are therefore covered in and the fumes aspirated through coke scrubbers.

In the Kessler system, the hot gases are first passed over the surface of a shallow layer of acid contained in a pan called the saturex, constructed of volvic stone. Over this pan a short 4-plate tower stands, connected by a wide pipe to a scrubber. The weak acid is fed continuously on to the top plate and flows from plate to plate, meeting the hot gases, which are caused to bubble through the layer of acid on each plate by callots, and so into the "saturex," and thence, in concentrated form, to the cooler. The Gaillard plant consists essentially of a large hollow tower built of volvic stone or acid-resisting tiles. Dilute acid is sprayed in at the top and meets hot gases from a furnace, which enter at the bottom and pass away at the top, carrying most of the water contained in the acid as well as some of the acid in the form of mist, which is caught in the coke scrubber.

The Gilchrist plant is a combination of a shallow covered-in pan connected with a high tower packed with broken quartz and pottery rings. The dilute

acid is fed in at the top of the tower and percolates through the packing, meeting the hot gases which enter the far end of the shallow pan, and which pass over the surface of the acid, and then up the tower and ultimately to the scrubber filled with quartz. The concentrated acid flows out from the end of the pan at which the furnace gases enter. Spent sulphuric acid contains considerable quantities of sulphates of iron and lead in solution and suspension, resulting from contact with the plant in which it has been used, and these sulphates are deposited as the acid is heated and concentrated, and form a sludge, which has to be removed periodically from the concentration plant. The ease and rapidity with which the sludge can be removed is of importance in considering the design of the various concentration plants.

### Key Industries List

THE official list of articles chargeable with duty under Part I. of the Safeguarding of Industries Act was issued last Saturday. It is a pamphlet of 73 pages, and the price is 9d. The schedule to the Act had already indicated in general terms the industries and classes of goods to be included, and under powers contained in the Act this detailed list is issued by the Board of Trade for the purpose of preventing disputes arising as to what goods are chargeable with duty. Some comment has been made on the large powers granted to the Board of Trade in issuing and subsequently from time to time amending such lists. These powers are to some extent qualified by Section 1 (5) which provides that if within three months after the publication of any list any person appearing to the Board to be interested delivers to the Board a written notice complaining that any article has been improperly included or excluded, the Board shall refer the complaint to the arbitration of a referee to be appointed by the Lord Chancellor, who shall not be an official of any Government department, and the decision of the referee shall be final and conclusive, and the list shall be amended so far as is necessary in order to give effect to the decision, without prejudice, however, to the validity of anything previously done thereunder.

The present list of articles is divided into eight sections: (a) Optical glass and optical elements, whether finished or not; (b) optical instruments; (c) scientific glassware; (d) laboratory porcelain; (e) scientific instruments; (f) gauges and measuring instruments of precision of the types used in engineering machine shops and viewing rooms, whether for use in such shops or rooms or not; (g) compounds (not including ores or minerals) of thorium, cerium, and the other rare earths; and (h) chemicals as distinct from dyestuffs.

The importance of the Act to the fine chemical industry is indicated by the fact that the chemical substances covered occupy 58 of the 73 pages, and number about 2,500. A distinguishing letter "D" opposite several entries signifies that the chemical indicated is covered by the Dyestuffs Act, and comes within the scope of the present Act only when importation has been permitted for purposes other than those with which the Dyestuffs Act is concerned. "R," again, signifies that the chemical indicated is included only when it is "pure," "puriss," "extra pure," "B.P.,"

"Ph.G.," "A.R.," "for analysis," "reagent," or when it is of special quality for meeting special tests for purity, and not when it is the crude product. In numbers of cases, this means that "industrial" qualities will be exempt while "fine" qualities will be included, and the dividing line apparently is to be determined by the Board on some percentage or similar basis.

According to the Act the duty will be charged on all the specified goods arriving in the United Kingdom on or after October 1—this day week. Importers are somewhat in doubt as to what "arrival" may mean,—whether it means not merely arrival in port but actual clearance through the Customs. It is believed that the Customs authorities will not insist on actual clearance before the expiration of September 30, but that goods reported to the Customs as having arrived before October 1 will be exempt. This is, after all, but a small concession, for the effect of applying the Act to all arrivals on or after October 1 makes it in effect retrospective in respect of goods ordered before that date. In the case of the Reparations Act a period of grace was allowed for goods contracted for before the date on which the Act began to operate, but our rulers are apparently satisfied that in this case sufficient notice has been given to importers.

### Workers and Economics

SIR W. J. NOBLE, one of the most progressive of modern industrial leaders, has just been urging upon every employer "to summon his workers together, setting aside prejudice and suspicion, with a view to bringing them into knowledge of the world facts of economics which shape and rule the destinies of his business, just as surely and ruthlessly as the climate governs the harvest." "Our country," he argues, "should become a vast university where the millions may learn day by day some of the lessons which economic laws thunder into the ears of those who have ears to hear. Until the extreme and one-sided economics—the economics of ruin of industry for ruin's own sake, the pulling down for sheer delight of pulling down and 'damning the consequences'—give place to the true, there cannot be a swift return to peace and plenty."

Upon those employers who will listen to him he presses the duty of frank enlightenment, and no advice could be more necessary or more timely. It is a new conception to think of industry as one vast university, and yet what could be more true? Somehow or another, employers on the whole fail to realise their responsibilities in this connexion. They leave their workers to the agitator, and then complain because their views of industrial problems are so crude and destructive. They profess to believe in the union of interests between employers and employed, but take no steps to spread that belief by precept or by practice. It is not necessary in this connexion that employers should endeavour to turn themselves into professors of economic theory, or endeavour to treat their work-people as children requiring education. If they will adopt the much easier and simpler plan of systematically and regularly telling their people all there is to tell about their own business, the fallacies of the spurious economics now so vigorously preached at every street corner will become self-evident, and revolution will go to a discount.

### New Standard Technical Works

DURING October four standard technical works of great importance to the chemical and gas industries will be published by Benn Brothers, Ltd. (proprietors of THE CHEMICAL AGE). Mr. Alwyne Meade, in a second edition, has brought his well-known "Modern Gasworks Practice" completely up to date, greatly enlarging the scope of the work and rewriting the greater part of the matter. The index of two thousand references will give to the book an encyclopædic character, and a very important chapter on "The complete Gasification of Coal" embodies the most modern theory and experience on this urgent current problem.

Mr. Walter Hole's standard "Distribution of Gas" now reaches its fourth edition. This book also has been rewritten, enlarged and brought thoroughly up to date, and two entirely new chapters have been written, one on "The Industrial Uses of Gas" and the other on "Inferential Meters."

"The Practical Chemistry of Coal and its Products," by A. E. Findlay, B.Sc., A.I.C., and R. Wigginton, B.Sc., A.R.C.S., embodies, with some additions, the laboratory course in fuel technology at Sheffield University, and should prove extremely useful to chemists engaged at gas works or coke ovens.

The well-known "By-Product Coking" of the late Stanley Cooper has been revised and brought into line with the latest technical developments by Mr. Ernest N. Myers.

### The Calendar

|       |   |  |
|-------|---|--|
| Sept. | Royal Photographic Society of Great Britain: 66th Annual Exhibition (closes October 29)                         | 35, Russell Square, London.                                      |
| 28    | Faraday Society: General Discussion on "Catalysis with Special Reference to Newer Theories of Chemical Action." | Institution of Electrical Engineers, Victoria Embankment, W.C.2. |
| Oct.  |   |  |
| 5     | Chemical Industry Club: Address by Sir William J. Pope, K.B.E., on his impressions of his tour in Canada        | 2, Whitehall Court, London.                                      |
| 7     | Society of Chemical Industry: Manchester Section: Chairman's address, "The Disposal of Waste Liquors."          | Textile Institute, 16, St. Mary's Parsonage, Manchester.         |
| 8     | Mining Institute of Scotland: General Meeting   | Edinburgh.   |
| 9-12  | Société de Chimie Industrielle: Annual Meeting  | Conservatoire National des Arts et Metiers Paris.                |
| 17    | Chemical Industry Club: Annual Meeting  | 2, Whitehall Court, London.                                      |
| 18    | Hull Chemical and Engineering Society: "Wrapping Machinery," F. Grover, A.M.I.E.E.                              | Wilberforce Café, Waterworks Street, Hull.                       |
| 20    | Society of Dyers and Colourists: West Riding Section: "The Dyeing of Artificial Silk." J. F. Briggs             | Bradford.  |
| 29    | British Association of Chemists: Annual Meeting   | Midland Hotel, Manchester  |

### Books Received

TECHNICAL RECORDS OF EXPLOSIVES SUPPLY, 1915-18. No. 3, Sulphuric Acid Concentration. London: Department of Scientific and Industrial Research. Pp. 91; 12s.  
AMERICAN SULPHURIC ACID PRACTICE. By Philip de Wolf and E. L. Larison. McGraw-Hill Book Co. Pp. 270; 21s.



## The Hydrolysis of Glycerides

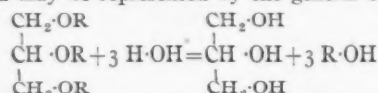
### Recent Advances in "Twitchell" Fat-Splitting

*The writer refers to the attention which is being paid at the present time to the Twitchell process, and the efforts which are being made to overcome some of the disadvantages associated with it. In addition, he discusses the production of a fat-splitting catalyst, akin to the original Twitchell reagent, but made from cymene.*

THE hydrolysis of oils and fats for the production of fatty acids and glycerine is carried through in practice principally by three methods, namely, the Autoclave process, the Twitchell process, and the Ferment process. There are to be found many points to favour the application of each particular process in special instances, but none of the three can claim to have a universal claim to supremacy.

In particular, however, the hydrolysis of fats by means of the Twitchell reagent, or modifications of this reagent, offers probably the cheapest method, and were it not on account of the dark colour of the fatty acids produced, and the long time required before a reasonably complete hydrolysis is effected, the process would come more into general application.

The reactions which take place when an oil or fat is hydrolysed may be represented by the general equation



It is accepted that the hydrolysis takes place in stages, and not as shown as a single-stage process. Again, the radical "R" may represent one or more fatty acids, for the natural oils and fats contain mixed glycerides. The reactions of hydrolysis, however, are capable of being effected by means of water alone, as shown in the above equation, and complete splitting effected. In practice the use of catalysts is general, since the shortening of the time of reaction, and the lower temperature at which the hydrolysis may be carried out—with consequent production of acids of better colour—are factors which cannot be overlooked. Forms of apparatus have been used, and still continue to be patented, for the hydrolysis of fats by means of water alone, under conditions of high temperature and pressure. Many forms of catalysts are known. Weak and concentrated acids such as hydrochloric acid were employed in the first splitting process, patented by Chevreul, who in 1823 first showed the oils and fats to be glycerides. Gases, such as the oxides and hydroxides of the alkali and alkaline earth metals, are used to a large extent as fat-splitting catalysts and, in the case of the soap industry, the amount of catalyst used is sufficient to neutralise the whole of the fatty acids produced. That the bases are true catalysts, however, is shown by the fact that under certain conditions—12 atmospheres' pressure—1 per cent. of lime is sufficient to effect complete hydrolysis in the presence, of course, of excess of water. At ordinary pressures, complete hydrolysis can only be effected with 12-14 per cent. of lime (calculated on the weight of fat), and this quantity, it should be noted, is in excess of that theoretically required to neutralise the fatty acids produced on hydrolysis.

The acceleration in the speed of hydrolysis by the use of the Twitchell reagent or by means of castor seed lipase or "ferment" is effected, in part at least by the intimate contact between fat and water which is obtained by the emulsification rendered possible. The hydrolytic action of the water is increased in speed, but not in nature. (It is interesting to note in passing that both the Twitchell reagent and the castor seed lipase can effect the reverse reaction, and synthesise fats from fatty acids and glycerine.)

#### Autoclave Processes

The catalytic or non-catalytic splitting of fats is materially increased in speed when higher temperatures are employed, as is to be expected. Hence, the use of high-pressure steam is naturally to be expected. Kliment has shown the effect of raising the pressure upon the extent of hydrolysis of fats. Thus, the acid values of the product from coco-nut oil, hydrolysed by means of water at 7 and 16 atmospheres of steam pressure, and in 2, 4 and 6 hours, were, respectively, 0.1, 0.3 and 0.5, and (at 15 atmospheres) 90.2, 123.9 and 185.5. The extent of hydrolysis as a percentage may be calculated by multiplying the above figures by 0.4. In the autoclave process for splitting fats, therefore, the combined effects of a catalyst—usually a base—and of high temperature

caused by high-pressure steam, are utilised. The fat, mixed with about 25 per cent. of water and 3 per cent. of lime, or 0.5 to 1 per cent. of zinc dust, or with a mixture of these, is charged into a cylindrical or spherical autoclave of copper, and heated. A pressure of 6 to 8 atmospheres is maintained in the autoclave, and hydrolysis is practically complete in about eight hours.

The products of the reaction (95-98 per cent. splitting) are allowed to settle, and subsequently the upper layer consisting of free fatty acids mixed with calcium or zinc soaps varying in amount according to the amount of the catalyst originally used is decomposed with sulphuric acid. The metallic soaps are converted into fatty acids and the solution of, say, zinc sulphate, is drawn off. The fatty acids are washed with water. They are of reasonably good colour, especially if it has been possible to keep the temperature low by working, say, at 6 atmospheres' pressure. The aqueous glycerine separated after the first settling operation is relatively easy to refine.

The obvious advantages of the autoclave process are the rapidity of operation and completeness of splitting as compared with Twitchell or Ferment hydrolysis, and the fatty acids are certainly lighter in colour than those usually obtained in the Twitchell process. On the other hand, however, apparatus is costly, repair charges are comparatively high, and control must be more rigorous than in the Twitchell process. Short reference may be made to the use of concentrated sulphuric acid in this type of process, since in this case the fatty acids finally recovered are not those present in the glycerides treated. Unsaturated acids, for instance oleic acid, are attacked and converted into solid hydroxy acids, &c. In this class of process, too, the high pressure, non-catalytic hydrolysis must be noted. The high temperatures required for any reasonable amount of hydrolysis form dark-coloured acids, and in general the process is not in favour. Some attention has been focussed recently, however, upon an apparatus for this purpose, in which remarkable results are claimed to be obtained. The autoclave (Austrian Patent, No. 81046, Bohn) is heated indirectly with superheated water, and is capable of standing a pressure of 35 atmospheres. Splitting is effected at about 240°C., and is carried to the extent of 97 per cent. in two or three hours. Perfect emulsification of fat and water is maintained.

#### Ferment Processes

The hydrolysis of the oil contained in seeds was noticed by Pelouze, as early as 1858. It was clear that the seeds contained some substance which accelerated hydrolysis of the glycerides. Several confirmatory and extended observations were later made, and in 1890, Green and Siegmund showed that castor seed possessed considerable power of fat splitting, due to its contained lipase. The observations were put to no practical use until the question was surveyed in 1902 by Connstein, Hoyer and Wartenberg. Experiments showed that the castor seed lipase could hydrolyse glycerides, if the latter were emulsified in weakly acid solution. The original process in which an emulsion of oil and weak acetic acid was effected in the presence of the ground castor seed and the whole left until hydrolysis was as complete as possible, was abandoned on account of the losses and difficulties encountered in the separation of the "middle layer." Thus, on attempting to "break" the emulsion after hydrolysis, three layers were formed, a lower layer of aqueous glycerine, an upper layer of free fatty acids, and a considerable middle layer containing the albuminoid matter together with relatively large quantities of glycerine water and fatty acids. This emulsion effectively resisted separation. After a series of modifications, the ferment process has been successfully applied. The lipolytic agent is extracted and used in place of the ground castor seed itself. Thus the decorticated castor seed is ground with a large quantity of water, and a creamy liquid obtained by filtration. This is allowed to ferment, whereupon a separation of water ensues, and a creamy emulsion rises. This contains 38 per cent. of the castor seed fatty acids, 58 per cent. of water, and 4 per cent. of albuminous matter, containing the lipolytic agent.

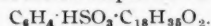


From 4 to 10 per cent. of this prepared ferment cream is emulsified with the oil and water (35-40 per cent. on the oil), in a lead-lined vessel, by means of an agitating air current. A small quantity—0.2 per cent.—of manganese sulphate is added, this salt having been found to be the best activator. The whole is left at a temperature of about 23°C., for two days or more, agitation being effected if the emulsion shows signs of a "break," particularly in the period immediately after commencement of hydrolysis. The hydrolysis is very sluggish below 20°C., and is impossible by reason of the killing of the enzyme above 43°C. A convenient temperature with solid fats is three degrees above the melting point, providing this be below about 33°C., so that if it be wished to hydrolyse a tallow, mixture with liquid oils must be effected, and the treatment of the whole carried out at, say, 35°C.

On completion of hydrolysis, the emulsion is heated to 80°C., 0.3 per cent.—or thereabouts—of 50 per cent. sulphuric acid is added and the whole settled. Three layers form, as described above, but the middle layer is by no means so large nor so difficult in treatment. It is separated, and when sufficient has accumulated, the heating to 80°C., and settling is again effected. The over-all loss of fatty acids and glycerine due to this middle layer is small. On account of the relatively low temperatures employed, the fatty acids obtained are of a light colour. The process is, however, long, and only about an 80 per cent. splitting can be effected in 24 hours, a further 10 per cent. of oil being hydrolysed after another day's contact with lipase and water. Also, the refining of the glycerine waters is not so straightforward as in the case of glycerine liquors resulting from other processes. The use of the castor seed lipase is almost, if not quite, universal, but other seeds contain fat-splitting enzymes. Thus, soya beans contain the same lipase as does castor seed, but the latter gives a greater efficiency in use. Animal lipolytic enzymes are, of course, known but their commercial use has not been possible.

#### The Twitchell Process

The power which certain sulphonic aromatic fatty acids possess of causing intimate and permanent emulsions between fats and water has been made use of in this process. The sulphonation of a mixture of benzene and oleic acid leads to the formation of benzene stearo sulphonic acid, of the formula



The Twitchell splitter is, however, manufactured from naphthalene, and has a greater activity than the above compound.

The fat or oil to be hydrolysed must first be purified from albuminous matter and inorganic impurities, but is preferably employed in a slightly hydrolysed condition, that is, containing a little free fatty acid. The purification is ordinarily effected by heating with a small percentage of sulphuric acid, and about 50 per cent. water, at 50°-70°C. The acid water treatment is carried out in lead-lined tanks and the freed oil is subsequently washed with water.

The purified fat is mixed with from one quarter to one half its weight of condensed water, and with one half to 2 per cent. of the splitting agent. Sulphuric acid to the extent of about 1 per cent. is also added, and the whole kept at the boiling point for a suitable period. The rate and extent of hydrolysis depend upon the concentration of the splitting agent, and vary with different oils and fats, and with the purity of the oils and fats. The hydrolysis can be brought to above 90 per cent. in 24 hours.

At a suitable stage of hydrolysis—the economic time being correlated with the minimum degree of splitting required—the emulsion is broken, if necessary with the aid of sulphuric acid, &c., and the fatty acids—identical with those existing in the original glycerides—are separated from the glycerine solution. The latter is reasonably concentrated, 15 per cent., and presents little difficulty in refining to dynamite or chemically pure glycerine. The fatty acids are discoloured, and often extremely so. The darkening being due, at least in part, to the action of oxygen, the absence of air contact during splitting is ensured by passing a current of steam over the surface of the emulsion in the splitting vessel. New types of reagents have appeared at intervals since the original Twitchell agent was introduced. Thus the "Kontakt" splitter, a sulphonic acid of naphthene hydrocarbons, has been widely advertised, particularly in Germany. This agent is stated to give a higher rate of hydrolysis and less coloured fatty acids. In this case, too, the quantity of

reagent employed naturally affects the speed of hydrolysis, as the following figures relating to the hydrolysis of linseed oil show.

With "Kontakt" splitter,  $\frac{1}{2}$  per cent., 80, 85 and 90-92 per cent. splitting was effected in 13, 15, and 20-24 hours respectively. With 1.5 per cent. of the same reagent, the same degrees of hydrolysis were attained in 5, 7 and 12 hours respectively, or roughly in half the time. The larger amount of reagent causes emulsification to be more persistent and thorough, and hydrolysis is consequently accelerated. Too great a proportion of the splitting agent must not be employed, however, as in addition to the less proportionate increased speed of hydrolysis, the emulsions are more difficult to separate, and the fatty acids are darker in colour.

The Twitchell process, on the whole, provides a very cheap, easily worked and straightforward fat splitting method. Installation costs are relatively slight, and expert attention is seldom required. The fatty acids are returned in their normal condition, no alteration to the unsaturated acids being effected. Were it not for the dark colour of the fatty acids which always results in a more or less marked degree, and the rather extended period of operation, the Twitchell process would no doubt be preferred to either the autoclave or the ferment process. It is not therefore surprising that efforts have been made recently to effect increased speed of hydrolysis with smaller quantities of a more active reagent, and to establish conditions ensuring as little discoloration of the fatty acids as possible.

#### Recent Investigations

The Pfeilring splitting agent of the United Chemical Works, of Charlottenburg, has been claimed not only to increase the rate at which hydrolysis of oils and fats occurs, but also to eliminate to a large extent the dark colour usually assumed by the fatty acids produced. The agent is prepared with the aid of hydrogenated castor oil in place of oleic acid, but the nature of the compound is not clear. On the other hand, however, Ubbelohde and Roederer (*Seif. Fabr.*, 1918, 425, 449 and 475) state that the speed of hydrolysis is not increased when the splitter manufactured from hydrogenated castor oil is used. Agreement is conceded, however, upon the question of the lighter colour of the fatty acids produced.

Increased speed of hydrolysis had been claimed in previous instances with the hydrogenated castor oil splitter, but this is now described to differences in the concentration of sulphuric acid in the emulsion. The influence of the presence of sulphuric acid is noted in connexion with the latest and apparently most highly efficient splitter, made from cymene.

The dark colour of the fatty acids produced by the Twitchell process is ascribed by Hoyer (*Zeit. Deut. Öl. und Fett Ind.*, 1921, 113) to the sulphuric acid present in the splitting operations, both in the compound and in the emulsion. This is of importance, if fully substantiated, for the cymene splitter is able to effect hydrolysis at a rapid rate in the absence of added sulphuric acid. The claim made (*vide infra*) that the use of this splitter yields a lighter coloured fatty acid mixture receives support from the above work of Hoyer. The fact that the rate of hydrolysis depends upon the amount of splitter, and in the amount of sulphuric acid (Hoyer), means that to increase the rate of hydrolysis ordinarily necessitates the production of darker fatty acids. The value of such a reagent as the cymene product is thus further emphasised. Hoyer also points out that there is less change of colour observed when a low degree of splitting is effected, and thus, that the fats are less susceptible to colour change than the free fatty acids.

The influence of air upon the colour of the fatty acids is usually admitted, and a stream of steam is kept over the surface of the emulsion in the splitting vessel. None the less, the fatty acids in the absence of sulphuric acid and other components of the emulsion are not so much affected by contact with air. Indeed, there has been a process patented (Happach, German Patent No. 4,569,561), in which air is used to bleach the dark coloured fatty acids from the Twitchell process. The acids are melted and treated at a temperature of 50°-70° with a current of air.

#### Cymene Sulphonic Acid

The splitting agent—for use in the Twitchell method of fat hydrolysis—manufactured from cymene, oleic acid and sulphuric acid appears to mark a distinct advance in many respects. It is claimed (McKee and Lewis, *Chem. Met. Eng.*, 1921, 969) that cymene stearo sulphonic acid is cheaper,

more efficient and more standardised in preparation than the elder Twitchell compounds made from naphthalene, benzene, &c. The claims of the authors are well borne out in laboratory experiments, but up to the present no details of large scale operation are available. The preparation of the splitting agent is even simpler than in the case of the elder Twitchell product. Cymene and oleic acid in molecular proportions are stirred vigorously, and about three molecular proportions of sulphuric acid are slowly added, whilst the temperature is maintained below 30°C. The intimate admixture is continued for about 24 hours, when water is added and the whole boiled. The separation of the cymene stearo sulphonic acid takes place, and the product is pure enough for industrial purposes. If desired, however, the acid can be treated with petroleum ether, in which the impurities are soluble, but the cymene stearo sulphonic acid is insoluble. Sulphonation of the cymene-oleic acid mixture can be effected much more rapidly at 100°C., and the product is equally efficient in fat-splitting operations.

The product may be represented by the formula,  $C_{10}H_{12} \cdot HSO_3 \cdot C_{18}H_{34}O_2$ .

In comparative experiments upon cotton seed oil, the efficiencies of the cymene stearo sulphonic acids made in the cold and in the hot, the Twitchell (naphthalene), the "Kontakt" and other splitting agents were tested. The new reagent is superior in every respect to any of the older reagents tested, and has the great advantage of effecting rapid hydrolysis of fats in the absence of the small amount of sulphuric acid usually necessary. According to opinions quoted above, the colour of the fatty acids produced is likely to be better, by reason of this. In effect, the fatty acids obtained when the cymene stearo sulphonic acid is employed are distinctly better in colour than those obtained in parallel experiments in which the older agents were employed. 0.5 per cent. of the cymene reagent effects rapid hydrolysis, but the use of 1 per cent. of sulphuric acid is advisable when this low concentration of splitter is taken. With 1 per cent. of the cymene reagent, no addition of sulphuric acid is required for rapid hydrolysis of glycerides. Figures are given in full in the paper already quoted, together with comparative graphs. It will be sufficient to give but a single example. 0.5 per cent. of the reagent in the presence of 1.0 per cent. of sulphuric acid, with 300 gms. each of cotton seed oil and water, gave a hydrolysis of 25 per cent. in two hours, 67 per cent. in three hours, and 87 per cent. in five hours.

Results substantiating the statement that the fatty acids produced when the cymene reagent is used are lighter in colour than those obtained with other reagents, are furnished by the following figures. The "red" and "yellow" readings in a 1 cm. cell of the Lobibond tintometer with the acids from coconut oil (95 per cent. splitting) and in the cases where the cymene reagent, the "Kontakt" reagent and the Twitchell reagent were used, were respectively 0.8 and 4.5-1.6 and 8.0-2.4 and 9.5. Cymene is easily obtained at the present time. It is a by-product from spruce wood pulp manufacture, and is available in large quantities. Its separation and rectification by distillation are matters which cause no trouble, and cymene can be produced as cheaply as benzene. Its sulphonation, alone or in the presence of oleic acid as described above, proceeds more simply, regularly and completely than that of benzene. The efficiency in hydrolysis and the light colour of the fatty acids produced conclude the list of its advantages.

#### Emulsification

It has been shown by Weston (THE CHEMICAL AGE, 1921, 604 and 638) that colloidal clay will emulsify oil and caustic soda solutions so that hydrolysis of the glycerides is accelerated. The Twitchell splitting of glycerides depends to a large extent on the emulsification caused by the added reagent. It seemed possible that colloids might increase the emulsification and induce more rapid hydrolysis. Preliminary experiments carried out with a highly dispersed colloid in addition to the ordinary Twitchell reagent indicated that this was effected.

In view of the fact that Weston has indicated results in this type of experiment, the writer considers it right to allow priority of publication of experiments in which colloids are used to increase emulsification—for the purpose of fat hydrolysis—to Weston.

## Indexing Chemical Equations

By Ingo W. D. Hackh

THERE are many chemical equations scattered through the literature which are important in more than one respect. Thus a certain reaction may have been studied and described by an author from an entirely different angle as to purpose, yet this same reaction may be utilised for practical purposes in a number of different ways. The fact that always more than one substance reacts, and that usually more than one reaction product is formed, indicates that every equation has more than one aspect and use, hence is entitled to be referred to at different places. In text-books and abstracts there is at present no attempt made to index systematically the reactions, respectively the equations. Undoubtedly an index of equations will be of value as it will indicate the way in which a substance might be prepared or manufactured, how it could be analysed or identified, in other words, what reactions a substance will undergo.

The matter of indexing equations becomes relatively simple by designating each equation with a number—this may be the page number or paragraph number in which the reaction occurs, and then making a list of formulæ in which the number of the equation stands either before or after the formula. Thus, substances which are reacting upon each other have the number *before* their formula, while the reaction products have the number *after* their formula. A few cases will sufficiently illustrate this method:—

- (1)  $S + O_2 = SO_2$ .
- (2)  $Fe + Cu^{++} = Fe^{++} + Cu$ .
- (3)  $CuSO_4 = CuO + SO_3$ .
- (4)  $Ba^{++} + SO_4^{--} = BaSO_4$ .

These four equations would appear in the index as follows:—

| BARIUM. |                   |   |
|---------|-------------------|---|
| 4 ..... | $Ba^{++}$ .....   |   |
| .....   | $BaSO_4$ .....    | 4 |
| COPPER. |                   |   |
| .....   | $Cu$ .....        | 2 |
| 2 ..... | $Cu^{++}$ .....   |   |
| .....   | $CuO$ .....       | 3 |
| 3 ..... | $CuSO_4$ .....    |   |
| IRON.   |                   |   |
| 2 ..... | $Fe$ .....        |   |
| .....   | $Fe^{++}$ .....   | 2 |
| OXYGEN. |                   |   |
| 1 ..... | $O_2$ .....       |   |
| SULPHUR |                   |   |
| 1 ..... | $S$ .....         |   |
| .....   | $SO_2$ .....      | 1 |
| .....   | $SO_3$ .....      | 3 |
| 4 ..... | $SO_4^{--}$ ..... |   |

This index reveals how a substance may be prepared (the reactions indicated on the right side), or how it may be analysed (the reactions indicated on the left side), that is, its chemical properties. Such a systematic index of equations seems also of value in a comparative study of reactions, for related elements have similar reactions.

The writer has indexed about 450 equations in this way\* and trusts that this simple method might be of service in exploiting more fully the facts conveyed by chemical equations.

\* "Chemical Reactions and their Equations," P. Blakiston's Son & Co., p. 119 ff.



## Reviews

**COCOA AND CHOCOLATE: THEIR CHEMISTRY AND MANUFACTURE.** By R. Whymper. (Second Edition). London: J. & A. Churchill, 1921. Pp. 568, 42s. net.

Published in 1912, the first edition of this book was soon recognised as a most useful work of reference, especially in connexion with the problems of cocoa and chocolate manufacture as distinct from cultivation and preparation. The present edition has been almost entirely re-written and brought up to date; in view of the rapid growth of the industry and of the need for introducing new methods of manufacture to increase output the task of revision must necessarily have been a considerable one.

The book is divided into three parts: (1) The history, botany and agriculture of cacao; (2) the manufacture of chocolates and cocoa powders; and (3) the Chemistry of cacao. The latter part is sub-divided into (a) a survey of the components of cacao, cocoa and chocolate, and (b) methods of analysis. It is clearly printed and contains a sufficiently complete index, fifteen plates and thirty-eight other figures and illustrations.

**CHEMISTRY OF PULP AND PAPER MAKING.** By E. Sutermeister. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. Pp. 479. 36s. net.

In addition to a discussion on the chemical aspects of the pulp and paper industry the author gives concise descriptions of most of the mechanical apparatus and operations involved. While no startlingly new features are brought out, the review of cellulose properties and paper-making fibres is a helpful contribution to the bibliography of this subject, including as it does a study of woods available for paper-making, their relative values, length of fibre, moisture content, specific weights of wood and chips, &c.

In Chapter IV. the author gives an illuminating account of the soda process in which he presents much valuable data; descriptions of the sulphate and sulphite processes are given in the next two chapters. The chapter on bleaching describes a number of commercial bleaching processes, and gives data with regard to the best conditions of operation, the majority of which are obtained from other investigators, and show widely varying results. In his preface the author draws attention to these divergences, stating that as the literature relating to the subject is in some cases contradictory in the extreme, he has endeavoured to present both sides as fairly as possible. Such differences of opinion are, however, often desirable in that they indicate lines of investigation leading to a better understanding of points which are for the moment obscure.

**EMINENT CHEMISTS OF OUR TIME.** By Benjamin Harrow, Ph.D. London: T. Fisher Unwin, Ltd. Pp. 248. 9s. net.

Quite a number of interesting facts are disclosed, probably for the first time, in this book; but its size prevents a full treatment of the lives of all of the eleven eminent chemists specially referred to. Some portions of the book might have been specially written for the layman, although it is hardly likely that it would appeal directly to such a constituency. For instance, we are told that from coal tar we get benzene, and that the chemical name of common salt is sodium chloride.

Far from being a dull historical treatise, the book is written in an interesting manner, although the Americanised spelling and the use of such words as "semester" render some of it rather strange to readers on this side of the Atlantic; similarly, it is strange to find in a book published in England a reference to the fact that "Messrs. Miller & Co., of Glasgow, were . . . able to supply Perkin with some quantity (of benzene), but the price was \$1.25 a gallon." There are also several errors in spelling, among which may be noted "forwith" (for forthwith) on page 2, "celetrities" (for celebrities) on page 54, and "Kukulé" (for Kekulé) on page 219.

The chemists whose biographies are given in this book comprise Sir W. H. Perkin, Mendeléeff, Sir William Ramsay, T. W. Richards, J. H. van't Hoff, Svante Arrhenius, Henri Moissan, Madame Curie, Victor Meyer, Ira Remsen and Emil Fischer.

It is interesting to note that not a few of these celebrities either had no intention of devoting their lives to chemistry, or made their first acquaintance with the science in a casual way.

For instance, we are told that Ramsay's introduction to chemistry was really due to his engagement in a football match, in which he sustained a broken leg. To lessen the monotony of convalescence, Ramsay read Graham's Chemistry with the object, as he frankly confessed, of learning how to make fireworks. Having entered the University of Glasgow, his first task in the laboratory was "getting the kinks out of a bundle of copper wire, an operation which lasted a week." Richards first wanted to be an artist, van't Hoff was destined to be an engineer, and Moissan started as an apprentice in a drug store; Remsen was to have been a doctor, and Fischer a merchant.

Dr. Harrow gives an amusing story about Remsen's first chemical experiment. Reading in a text-book that nitric acid acts upon copper, young Remsen decided that, having a copper coin and a bottle of nitric acid, he had only to learn what the words "acts upon" meant. Pouring the acid on the coin, a greenish-blue liquid foamed over the table, and a suffocating dark-red cloud arose. Telling the story himself, Remsen said: "I tried to get rid of the objectionable mess by picking it up and throwing it out of the window, which I had meanwhile opened. I learnt one fact—nitric acid not only acts upon copper, but it acts upon fingers. The pain led me to an unpremeditated experiment. I drew my fingers across my trousers, and another fact was discovered—nitric acid acts upon trousers."

**INDUSTRIAL AND POWER ALCOHOL.** By R. C. Farmer, O.B.E., D.Sc., &c. London: Sir Isaac Pitman & Sons, Ltd. Pp. 110; 2s. 6d.

The author aims at giving an indication of the widespread chemical and industrial uses to which alcohol may be applied, including medicinal products, dyes, photographic materials, celluloid and fine chemicals. Within such narrow limits an exhaustive treatment was not to be expected, but the author has produced an admirable primer which covers briefly but intelligently the main aspects of the subject, both technical and commercial, and serves as an excellent summary. He has not overlooked the most recent developments, but has chapters on vegetable sources of alcohol and on synthetic alcohol, recognising the desirability of drawing our supplies of motor fuel from recurrent vegetable sources instead of from the world's fixed capital of mineral wealth. It is altogether a most workmanlike piece of condensation.

**TEXTILE BLEACHING.** By Alec B. Steven, B.Sc., F.I.C. London: Sir Isaac Pitman & Sons, Ltd. Pp. 134; 3s.

This is a brief account of the development and present-day methods of textile bleaching, intended for non-technical readers. It is clearly written, unpretentious in character, and well designed for the purpose the author, who holds a lectureship on bleaching, dyeing, &c., at the Royal Technical College, Glasgow, had in view.

**INTRODUCTION TO TEXTILE CHEMISTRY.** By H. Harper, A.R.C.S., B.Sc., A.I.C. London: Macmillan & Co., Ltd. Pp. 189. 3s. 6d.

Macmillan's Life and Work Series, in which this volume appears, is specially planned to meet the needs of the continuation courses of instruction contemplated by the Education Act of 1918, and aims at satisfying two distinct purposes—one cultural and the other vocational. If all the volumes fit the purpose in view as well as this one, the series should be of real educational value.

A short account is given of some of the important properties of the textile fibres and the materials used in their treatment, but the author's chief object is to provide a series of experiments illustrating these properties, in order to interest students in the various branches of textile work in the materials with which they deal. All the experiments can be carried out with the equipment found in an ordinary chemical laboratory. Purely mechanical processes have been either omitted or treated very briefly, sometimes being merely mentioned. The principles of chemical reactions underlying manufacturing processes are dealt with in a simple manner, and should be readily understood by any reader who has an elementary knowledge of chemistry. Twelve years' teaching on the lines indicated in the book has convinced the author that students of textiles can be made to take a wider view of their own particular branch of the industry with ultimate benefit to the other branches.



## Holloway Rubber College: Past Work and Prospects

THE opening on Monday next, September 26, of the second year of the Northern Polytechnic Institute's Rubber Courses, under the direction of Dr. Schidrowitz, affords an opportunity for reviewing the results obtained in the first session of the remodelled scheme and the outlook for the future.

rubber works and of firms closely associated with the rubber industry (chemicals, repairs, machinery, &c.).

(c) Several rubber works engineers.

(d) Member of rubber works' staffs, partly technical, partly on the business side.

### Classes for 1921-22

Partly as a result of the gradually spreading knowledge of the good work which is being accomplished, partly owing to the excellent and informative display at the Northern Polytechnic's Stall at the Rubber Exhibition, inquiries as to the classes have been very numerous, and an excellent attendance for the current year is anticipated. Not only have such inquiries come from this country and other parts of the Empire, but much interest in the scheme has been evinced by many associated with education or research in Holland, Denmark, France, Belgium, Brazil, &c. It is hoped that students coming from abroad will serve to form friendly links between the British rubber industry and trade and foreign countries. One transatlantic Government, desirous of cultivating and improving trade relations between its own and this country has retained one of its technical officers, sent over in connexion with the Exhibition, to attend the Holloway Rubber College for the coming year.

### Scholarships Scheme

It will be remembered that an appeal was made to the trade during the past year for funds to establish scholarships, and for the purchase of further equipment and building. While, owing to the extremely adverse trade conditions the full amount desired was not raised, reasonable progress, considering the circumstances, was made, and two scholarships, each of the value of £200 and tenable for one year, have been awarded, namely to Mr. B. Beardmore Evans, B.Sc., and to Mr. Cyril H. Birkitt, B.Sc.

### New Plant

In addition to the existing workshop plant (two mixers,



GENERAL VIEW OF PART OF THE RUBBER WORKSHOP.

Notwithstanding the fact that the initial stages of a new venture of this kind are always difficult, and that the facilities afforded to those already in or to those desirous of entering the rubber industry only became more or less fully appreciated as the year wore on, the attendance at the day and evening classes must be considered remarkably good. In all some 35 to 40 students, whole and part time, passed through the Courses. It is not without interest to analyse the nature of the profession, intended profession, or business of those who attended.

### Day Classes

Among those in the Day Classes were:—

(a) Two qualified chemists; one a works chemist, the other a gentleman training for work in the F.M.S. (Dept. Agriculture) Chemical Service.

(b) A rubber buyer of one of the largest factories in the world desirous of obtaining knowledge as to methods of factory control of crude rubber.

(c) A young man training for the experimental and research department (on the mechanical side) of a rubber works.

(d) A (pre-war) rubber worker training for the rubber works laboratory.

(e) The son of the head of a rubber works, training to qualify for a position in the laboratory and works.

(f) Two inventors (post-graduates), one connected with the tyre industry, the other with dental rubber work, desirous of improving their knowledge of rubber chemistry and technology. In regard to the latter, it may be pointed out that special facilities for research are afforded to those wishing to specialise in definite branches of the industry.

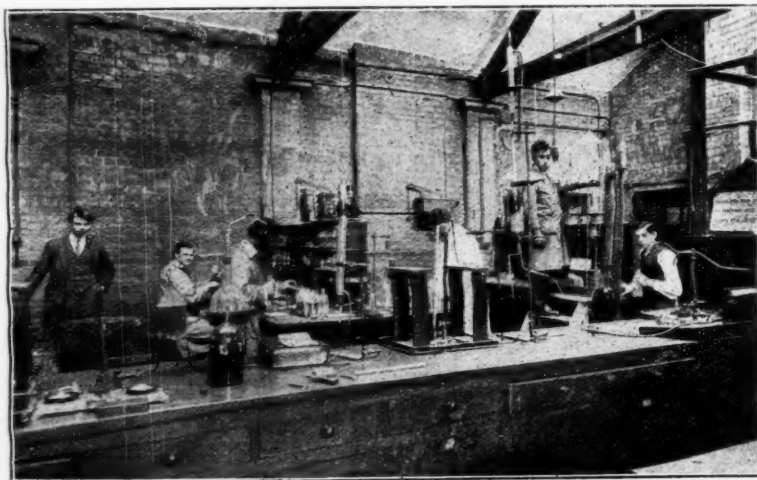
### Evening Classes

Among those attending the "advanced" and "elementary" evening classes were:—

(a) Several works chemists.

(b) A number of managers of technical departments in

open vulcanizer, screw press, washing machine, oil vulcanizer, Schopper machine, &c.) an enclosed mixer or masticator made by J. Baker Sons & Perkins, and an autoclave (pan) press have been installed, and a three-bowl calendar by David Bridge & Co., Ltd., is to be erected by the commencement of



A CORNER OF ONE OF THE CHEMICAL LABORATORIES.

the session. Several new pieces of testing plant by Cussons, of Manchester, have been delivered. For the chemical laboratory a new centrifugal apparatus and various small articles have been obtained.

#### Course of Instruction

The day courses are mainly designed for post-graduates desirous of acquiring the special knowledge of rubber chemistry, physics and technology required by those entering a rubber works laboratory or experimental department. The necessary training to enable a man to take up rubber research is also afforded. In the case of non-graduates taking the day courses, special lectures and practical work in chemistry, physics, mathematics, botany and engineering are arranged for, according to the individual's knowledge or requirements. In all cases, however, students are required to spend a portion



STUDENT WORKING A SCHOPPER MACHINE.

of their time in the engineering workshops, where they are instructed in the use of the lathe, drill, planing machines, &c., pass through a course of mechanical drawing, and finally are taught to make various types of moulds and simple apparatus, such as are required in a rubber works.

Dr. Schidrowitz is very keen on getting the rubber chemist and rubber engineer to understand one another and each other's habit of mind and requirements, hence his insistence on the rubber chemist's or physicist's training in practical engineering. He holds that when the chemist approaches the engineer with a problem that requires working out, he should appreciate the engineer's difficulties and so be able to place the problem before him in a manner comprehensible to the engineer—and *vice versa*.

It is important to add that the day and advanced evening courses are suitable for the examination for the Fellowship of the Institute of Chemistry (F.I.C.).

The Council of the SOCIETY OF CHEMICAL INDUSTRY has received an invitation to hold the 1922 Annual General Meeting in Glasgow.

## British Dyes

To the Editor of THE CHEMICAL AGE

SIR.—Signs are not wanting that the dyestuffs industry may shortly move for the better, and with the prospect of an improved industrial situation a word of warning may be offered to the wise. It is common knowledge that many manufacturers have large unsold stocks of material, and that the trade slump, coupled with temporary over-production, is partly responsible for the fact. In some cases, however, the unsaleability is understood to be due, at least in part, to inferior quality and to an impure product. Anything was good enough for the public when the public could get nothing else. Now, when satisfactory dyes can be procured from foreign markets, there is reason to fear that obstructions will be placed to hinder their importation until the inferior British product has been foisted upon the unwilling British buyer. It is but fulfilling precisely what several months ago was suggested might happen, and the procedure is absolutely iniquitous. For dye factories to shelter themselves behind the catch phrase that they are the potential arsenals of the nation may be eminently satisfactory to the shareholders, but it bodes ill to the people at large. "Every vat," quoth Pilgrim's Progress, "must stand on its own bottom."

The Import Restrictions Act was designed to aid an infant industry, and not to abet the sale of inferior goods at enhanced prices. This nation believes that the product of British intellect and industry can be as good as that of any other country. This nation wants the best that can be obtained—for our present purpose, the matter is dyes—and unless we are much mistaken she intends to have it. Unless dye manufacturers will give us only of the best, and will not place upon the market inferior products, as the result of either careless work or of a mistaken policy, they will find that this country is not prepared to acquiesce in a specious form of self-robbery. We have been taught enough of that—too much, in fact—and it is likely that the advice of the near future will be—get on, or get out.—Yours, etc. W.

## Machinery at Olympia

### Further Review of the Exhibits

IN addition to the exhibits previously noticed in THE CHEMICAL AGE, the following are of interest. Lancaster & Tonge, Ltd., of the Lancaster Works, Pendleton, Manchester, are showing "Lancaster" steam traps of a new type which have been redesigned so as to occupy smaller space and to obtain the maximum strength and casing. Their bucket type traps, which are also shown, are, the firm state, a distinct advance on previous practice. The float has a leverage of six to one over the valve, enabling the smallest size to discharge 400 gallons per hour at a pressure of 150 lb. per square inch. Other features of their exhibit are steam dryers, limit and super-limit rings and metallic packing.

R. Trist & Co., Ltd., of 12, Clipstone Street, W. 1, show a safety device for oil-fired boilers, which will, it is claimed, instantaneously cut off the oil supply to the furnaces when the water reaches danger level. They are also showing carbide lights, rotary oil pumps, tar-melting kettles, &c.

Hydraulic Gears, Ltd., of Beaver Lane, Hammersmith, W. 6, have a large and comprehensive show, a feature of which is a variable speed transmission set which has been designed to illustrate the various advantages possessed by the Hele-Shaw variable speed transmission gears. They show a high-pressure pumping set which consists of one of the smallest size Hele-Shaw pumps mounted on a cast-iron bedplate, along with an electro-motor, to which it is direct coupled through a flexible coupling. This type of pump, it is stated, is suitable for press work of all descriptions, and for all propositions where a steady flow of liquid is required at a constant pressure. Another exhibit is a low-pressure oil circulating pump which is arranged for circulating large volumes of lubricating oil, or similar liquids, at comparatively low pressures. The pump exhibited is designed to handle 20 tons of lubricating oil per hour at a pressure of 30 lb. per square inch.

Waste heat boilers, made under Kirke's patents, are shown by Spencer-Bonecourt, Ltd., of Parliament Mansions, Victoria Street, S.W. 1, who also display economisers, superheaters, and air receivers, as well as gas and oil-fired boilers for land, locomotive and marine purposes.

## The British Association Meeting at Edinburgh Concluding Reports of the Chemical Section

*We give below the concluding portion of our Report of the Chemistry Section of the British Association at Edinburgh, which came to an end on September 14.*

### Synthesis of Formaldehyde and Carbohydrates

ON September 12, following the discussion on biochemistry, a paper on the "Synthesis of Formaldehyde and Carbohydrates from Carbon Dioxide and Water," by Professor E. C. C. Baly, Professor I. M. Heilbron and W. F. Barker, was read by Professor Baly, who referred first to the reason which led to the investigations described, which related to the well-known reaction between hydrogen and chlorine. These two gases did not combine together unless energy was applied to them, usually in the form of light. A quantitative investigation of this reaction was made, and it was found that the velocity of the reaction was not proportional to the intensity of the light. Another way of saying the same thing was that the quantity of hydrochloric acid produced per unit quantity of energy absorbed was not constant, but increased rapidly as the intensity increased. That result was obviously very surprising, because any single theory of absorption led to the view that a given quantity of energy always produced the same quantity of hydrochloric acid. On the other hand, the explanation of the phenomenon was perfectly simple if the reaction was considered in all its stages. Energy was evolved with a radiation in the infra-red region of the spectrum, and this energy was radiated at oscillation frequencies which were characteristic of hydrochloric acid. The oscillation frequencies of the hydrogen and chlorine molecule were exactly the same as those of chlorine, and as this energy was radiated at these frequencies, some of the energy was absorbed by surrounding chlorine molecules, so that these chlorine molecules would become partially activated. What it meant was that for a given quantity which made two molecules react, there would be many more molecules reacting than would be expected, because the energy or part of it could be reabsorbed to activate more chlorine, and so the reaction went on, and a great deal more hydrogen chloride was formed than the simple theory would lead us to expect.

#### Reabsorption of Radiated Energy

The principle of the reabsorption of the radiated energy could be applied in another direction. The photochemical reaction which was of the greatest interest at the moment was the great photochemical reaction or photosynthesis taking place in the living plant, by the synthesis of carbohydrates from carbon dioxide and water. It was known that carbon dioxide and its solution in water only absorbed very short wave-lengths of ultra-violet light. That was the first stage, and it was important because the first stage could not take place in sunshine, because that short wave-length was absent from sunshine, it having been previously absorbed by the atmosphere.

He believed that an explanation of the phenomenon was to be found in photocatalysis, by the reabsorption of the radiated energy, and it was suggested by himself and his co-authors that the chlorophyll was really acting as a catalyst. It absorbed visible light and radiated it at frequencies which could be reabsorbed by the carbon dioxide and water or carbonic acid, and the result was that the synthesis began.

There was some doubt about the effect on carbonic acid when exposed to short wave-length ultra-violet light. Moore and Webster had said that it gave no traces of formaldehyde in ultra-violet light, but that it did in the presence of certain catalysts.

That was quite true up to a certain point, but if the carbon dioxide was passed through the solution during the exposure, distinct traces of formaldehyde were found. The formaldehyde, however, was only found when the carbon dioxide was bubbled through the solution. Moore & Webster had also stated that under the influence of light, carbon dioxide was polymerised to sugar, and that, the present authors believed, was one of the explanations of why no evidence of formaldehyde was obtained if carbon dioxide was not bubbled through the solution, because it was polymerised as soon as it was

formed. If the carbon dioxide was bubbled through, however, polymerisation took place more slowly, and traces of formaldehyde could be detected.

#### Identical Infra-Red Frequency

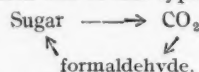
Having proved this stage, the next was to find out whether it was possible to carry out the reaction with visible light; could a photo-catalyst be found that was capable of carrying out that reaction? It was found that the criterion was that the substance must have an identical infra-red frequency, and to secure this all that was necessary was a coloured base.

Among other things, he tried malachite green and methyl orange, and in this way, under the influence of ultra-violet light, considerable quantities of formaldehyde were formed. The most important reason for this was that the dyestuff happened to absorb the rays which polymerised formaldehyde to sugar, and consequently the dyestuff, in addition to acting on the photo-catalyst, acted as a protector for the formaldehyde which was formed. He and his co-authors believed that was the explanation of the function of Moore & Webster's so-called catalysts, because they had proved that each of the salts which Moore & Webster used as catalysts had the power of selectively absorbing the very rays which polymerised the formaldehyde and were transparent to those rays which produced the formaldehyde, and in the presence of these substances one would expect to get formaldehyde.

It could be taken for granted that the first stage in the synthesis was the production of formaldehyde, and secondly, the present authors had succeeded in producing formaldehyde in visible light, as it was presumed is done in the plant.

The second stage of the reaction, viz., the polymerisation of formaldehyde to sugar, required a coloured substance which had the power of forming an addition complex with the formaldehyde, and they had not yet been able to find a suitable substance for that purpose, but collateral experiments left no doubt that this reaction could be photo-catalysed.

Moore & Webster's statement that a substance of biochemical origin gave formaldehyde on exposure to ultra-violet light was rather misleading, inasmuch as the statement was incomplete. Suppose they took a solution of glycerol, as Moore & Webster did, and exposed it to ultra-violet light, it was quite true that respectable quantities of formaldehyde were produced from which a quantity of sugar was formed. That had been found to be true of any substance of biochemical origin, and also for other substances, particularly acetone and oxalic acid. Therefore, even if formaldehyde were produced by decomposition of the carbohydrates, and sugar produced at the same time, in the case of acetone and oxalic acid it was perfectly well known that the formaldehyde was not a direct photo-chemical decomposition product. Consequently, the formaldehyde must have been produced by a decomposition of the acetone or the oxalic acid, first into carbon dioxide, then into formaldehyde and then to sugar, and that was where the sugar came from. This threw an entirely different light on Moore & Webster's statement. A photo equilibrium was established which was of this type



#### Conclusions

The conclusions come to, therefore, were: (1) It is possible to synthesise formaldehyde from carbon dioxide and water. (2) To polymerise formaldehyde to sugar in the presence of light. (3) That both of these stages have been photocatalysed and have been carried out in visible light.

When we came to the living plant in which we assumed the process was a photo-catalytic one, the evidence was very doubtful as to whether it actually went through the stage of formaldehyde or not. If, however, we had a photo-catalyst which was capable of photo-catalysing both stages, it was obvious that any formaldehyde could be detected in the plant because the whole process would take place in the one stage.



In chlorophyll one had an ideal substance for acting as a catalyst in both stages. All this work was put forward merely as preliminary, but he felt that it enabled the formulation of a possible theory of photo-synthesis. He hoped to continue the experiments because there was certainly further work to do.

#### Discussion

Dr. E. J. RUSSELL said that agricultural chemists were very glad Professor Baly had taken up this highly important subject. He would have liked to have heard more about the chlorophyll and the part that it played, because in the plant the whole of the reaction was brought about by the chlorophyll. One very important point which pure chemists did not usually appreciate in this reaction was the part magnesium played. When agricultural chemists attempted to increase the growth of a plant they did not give it a magnesium fertiliser. The amount of magnesium which a plant took up from the soil was very small indeed. They could very largely increase photo-synthesis not by adding magnesium but by adding potassium compounds. What was wanted to be known, however, was what was the function of potassium compounds?

At Rothamsted a considerable time had been spent hunting for the sugars in the plant, and the first visible product was cane sugar. That was broken down, or hydrolysed, and they got dextrose and cellulose, which was shifted from the leaves to the various parts of the plants, where they were again built up into sugar, or starch, or something else according to the plant. All these changes had quite simple physical or chemical explanations if they could only be got at.

PROFESSOR BALY, replying to the discussion, said he wished it to be very clearly understood that the authors had been very careful in all they had said to steer clear of doing anything more than deal with the simple idea of photo-synthesis in itself, its mechanism, and its photo-catalysis. He wished to keep the subject matter of the paper down to the bedrock of the physical explanation of the process itself.

### Non-Aromatic Diazonium Salts

The Report of the Committee, consisting of Dr. F. D. Chattaway, Professor G. T. Morgan, Dr. N. V. Sidgwick and Mr. P. G. W. Bayly, and drawn up by Professor Morgan and Mr. H. Burgess, stated that recent investigations had shown that several series of non-aromatic primary amines possessed in varying degrees the property of diazotisability. In certain cases the existence of a diazo-derivative was inferred from the property of coupling to form azo-derivatives or from the fact that the diazo-group could be replaced by other radicals such as chlorine, but in other instances diazonium salts had actually been isolated.

These non-aromatic diazonium salts varied considerably in stability from the exceptionally stable diazonium salts of the pyrazole series to the explosive diazo-derivatives of the thiazole group. Orientation played an important part in the stability of these compounds.

The requisite properties for diazotisability appeared to be the presence of the group  $\text{H}_2\text{N}-\text{C}^{\text{II}}$  and the possession of a certain degree of unsaturation in the cyclic system in which this carbon atom was included. It must not be assumed, however, that any base having the foregoing group and belonging to an unsaturated cyclic system was necessarily diazotisable. The absence of diazotisability was noteworthy in the thiophen, furane and pyrrole series in spite of the close relationship between the first of these series and the aromatic compounds.

The report dealt in detail with the pyrazole, pyrazolone, iso-oxazole, glyoxaline, triazole, thiazole, pyridine and quino-line series.

### Citric Solubility of Mineral Phosphates

Reading a paper on the above subject, Dr. J. F. Tocher pointed out that "citric solubility" in the official sense referred to the solubility of phosphates in basic slag and in basic superphosphate, when 5 grams of the fertiliser and 500 cc. of water containing 10 grams citric acid were continuously agitated in a litre flask for the period of half an hour at the ordinary temperature. The results of other workers on citric solubility were noted.

Robertson, for instance, had shown that mineral phosphate,

to which the official test did not appear to be applicable, was completely soluble in a 2 per cent. citric-acid solution if a sufficient number of extracts were made by successive half-hour contacts. Stead had found that for normal basic slag solubility increased with the amount of silica present. Ramsay had found that 91 per cent. of the total phosphoric-acid content of tricalcium phosphate was soluble in the prescribed 2 per cent. citric-acid solution in 30 minutes. Russell and Prescott had established the fact that absorption of phosphate took place in soils during long periods of contact. Bassett had shown that the constitution of the phosphate in mineral phosphite was  $\text{Ca}(\text{OH})_2\text{Ca}_3(\text{PO}_4)_2$ .

#### Results Under Varying Conditions

The author gave the results of the citric solubility of mineral phosphate under three different conditions: (1) In various dilutions, the quantities of citric acid and of mineral phosphate being constant; (2) in varying concentrations of acid, the volume of fluid and weight of mineral phosphate taken being constant; (3) with varying amounts of the phosphatic fertiliser, the value of fluid and concentration of acid being both constant.

It was shown that in varying dilutions—condition (1)—the quantities of citric acid and mineral phosphate being kept constant, citric solubility could be described by the

equation  $k = \frac{u^4}{w^3}$ , where  $w$  = molecular concentration of citric acid at equilibrium end of 30 minutes and  $u$  = the molecular concentration of phosphate at equilibrium. If  $m_1$  quantity of citric acid taken,  $m_2$  quantity of mineral phosphate taken and  $m_3$  volume,  $m_3$  in this case being the variable, it is shown that if  $\frac{m_1}{m_2} = 2$ , dicalcium phosphate is in equilibrium with tricalcium

phosphate. If  $\frac{m_1}{m_2} = 10$ , tricalcium phosphate is in equilibrium with both dicalcium and monocalcium phosphate. This was the condition brought about in one of the unofficial tests applied to mineral phosphate where a 0.2 per cent. solution of citric acid was used in 5,000 cc., 1 gram mineral phosphate being used instead of 5 grams specified for slag.

#### Citric Acid Concentration

In a second series of experiments where the varying factor was citric-acid concentration, the volume and the weight of mineral phosphate being both kept constant—condition (2)—the author showed that an equation similar in character to the

first,  $\frac{2u^2}{w^{3/2}} = k$ , accurately described the solubility of mineral phosphate in varying degrees of acid concentration. In this case  $w$  represented the molecular concentration of acid at equilibrium.

In the third series of experiments, where the quantity of mineral phosphate was the varying factor, the volume of the fluid and acid concentration being both kept constant—condition (3)—citric solubility decreased with increasing quantities of mineral phosphate.

In the first series of experiments the citric solubility varied from 19.24 to 28.14 per cent. of the weight taken when  $\frac{m_1}{m_2} = 2$ .

On the other hand when  $\frac{m_1}{m_2} = 10$  the citric solubility varied with increasing dilution from 53.8 to 61.8 per cent. of weight of fertiliser taken. In the second series where  $\frac{m_3}{m_2} = 100$ ,

citric solubility increased from 4.4 to 19.4 per cent. of weight of mineral phosphate taken, due to increased acid concentration. In the third series of experiments where  $\frac{m_3}{m_1} = 50$ ,

citric solubility decreased from 19.41 to 1.03 per cent. of weight of mineral phosphate taken, due to increasing amounts of alkaline lime derived from the increasing quantities of mineral phosphate used in the experiments. These results were, said the author, well-known effects deducible from physico-chemical laws. It was shown that, with a suitable selection of conditions, citric solubility could vary from perfect solubility on the one hand, to no citric solubility at all.

The author's conclusions were: If  $w_2$  = the weight of the mineral phosphate used, i.e., weight of factor  $Q_2/w_1$  = the

amount of phosphate expressed as  $\text{Ca}_3\text{P}_2\text{O}_8$ , dissolved out of  $w_2$  by the citric acid used, citric acid being factor  $Q_1$  and  $v$  the actual volume of solution, i.e., volume of factor,  $Q_3$ , then it is found—condition (1)—that  $\frac{100w_1}{w_2}$  increased rapidly with increasing values of  $v$ , of the factor  $Q_3$ , the factors  $Q_1$  and  $Q_2$  being constant. Under the varying dilutions used, with the constant quantities of  $Q_1$  (5 grams), and  $Q_2$  (10 grams), the values of the citric solubility  $\frac{100w_1}{w_2}$  varied from 19.24 to 28.14 per cent. of mineral phosphate taken. With the constant quantities of  $Q_1$  (1 gram), and  $Q_2$  (10 grams) the citric solubility varied with increasing dilution from 53.8 to 61.8 per cent. The effect of the presence of alkaline lime had been eliminated by maintaining  $\frac{m_1}{m_2}$  at a constant value and, with

increasing dissociation as a result of increasing dilution, we got increasing percentages of phosphate dissolved. The molecular concentration, on the other hand, being the number of units of mass in unit volume (i.e., number of gram molecules per litre), decreased with increasing dilution.

In the second condition where  $Q_2$  and  $Q_3$  remained constant with the actual variations in  $Q_1$  from 1 to 10 grams, the citric solubility  $\frac{100w_1}{w_2}$  varied from 4.4 to 19.4 per cent. of the weight of mineral phosphate taken.

Considering the third condition, where  $Q_1$  and  $Q_3$  remained constant, and the actual variations in  $Q_2$  were from 5 to 40 grams, the citric solubility  $\frac{100w_1}{w_2}$  decreased from 19 to 1 per cent. of weight of mineral phosphate taken. In other words  $Q_2$  and  $Q_3$  being constant, citric solubility decreased with increasing amounts of fertiliser used, this decrease being due to the presence of  $\text{Ca}(\text{OH})_2$  in (1) the molecule of hydroxyapatite and (2) also in the free condition as  $\text{Ca}(\text{OH})_2$ ,  $\text{CaO}$  or  $\text{CaCO}_3$ , and to the fact that the result is expressed in terms of the weight of mineral phosphate taken for analysis.

#### Choice of Constant Values

Other conditions being constant, citric solubility depended upon an unlimited choice of constant values of any two factors, together with an unlimited number of values of the third varying factor. If, therefore, a citric solubility test had to be adopted, the theoretical condition determining the relative quantities of  $Q_1$ ,  $Q_2$  and  $Q_3$  must be found, otherwise the test had no practical value. Wagner had not supplied any theoretical basis for selecting the specified constant quantities of the three factors. We could, therefore, at will select for slags suitable values of  $Q_1$ ,  $Q_2$  and  $Q_3$  to secure high citric solubility values. We could, however, select at will quite different values of  $Q_1$ ,  $Q_2$  and  $Q_3$  which would give equal high citric solubility values for mineral phosphates. Further, we could select for both slags and mineral phosphates suitable values of  $Q_1$ ,  $Q_2$  and  $Q_3$ , which would give, on the one hand, perfect citric solubility or, on the other hand, no citric solubility at all.

Citric solubility, if applied to slags, might in a certain degree be a measure of fineness of grinding if slags of exactly the same composition were tested. If, as was frequently now the case, slags differed widely in chemical composition and constitution, citric solubility was an unreliable test of their agricultural value, because we could set the conditions to get any value we liked. The same remarks applied with equal force to mineral phosphates, although quite possibly mineral phosphates might vary to a lesser extent in chemical composition.

We were driven, therefore, to the conclusion that the only practical tests of value, from the agricultural standpoint, in determining the phosphatic content of slags and mineral phosphates were: (1) Total phosphatic content; (2) degree of fineness of grinding; and (3) freedom from injurious and inhibiting substances.

#### Measurement of Surface Tension

A paper on "The Measurement of Surface Tension over a Wide Range of Temperature" was read on Sept. 13 by Professor F. M. Jager, Professor of Chemistry at Groningen University. The author said the investigations dealt with had been carried out with the object of arriving at a method for

measuring the surface tension of a number of chemical substances at temperatures ranging from 80°C. to 1,650°C. The experimental difficulties of such quantitative measurements usually increased with an increase of temperature. With ordinary experimenters reasonable accuracy could be obtained up to 500°C., but beyond that, in many cases, measurements were almost impracticable in the ordinary way, using the ordinary capillary tube method.

#### Even Distribution

The great difficulty with high temperature work was to get the temperature evenly distributed. The furnace used in this case consisted of a cylinder of magnesite, under which was wound a thick platinum coil. In the middle of that furnace there was a portion within which the temperature remained practically constant, and this enabled him to get reliable results so far as constancy of temperature was concerned. That was one reason why he did not use the ordinary method of the capillary tube. Another reason was that certain German investigators had tried the capillary tube method with molten salts, but when the tube was afterwards examined under the microscope, the inside of the tube was found to be damaged. There had been chemical action due to the high temperature, and it was well known that surface tension was extremely sensitive to impurities.

He had found that there was only one method which was applicable to really high temperatures, and in this a slow current of nitrogen entered the liquid through a platinum capillary immersed to a known depth, so that small gas bubbles were found at the sharp edge of the tube, and the minimum gas pressure to burst the bubble was measured. This pressure was connected in a known way with the radius of the tube, the density of the liquid at the temperature given, and the surface tension sought. The method had been applied to many organic substances and inorganic salts.

One of the first things to do was to measure the temperature at the spot where the bubble was formed, and this was done by means of carefully calibrated thermo-couples of a platinum and platinum rhodium alloy, the E.M.F. of the thermo-couples being determined by a potentiometer and expressed in microvolts. Suitable means were arranged for adjusting the thermo-couples and temperature changes to within 1/10°C. were easily measured, whilst in the apparatus the temperature could be maintained constant within 1°C. for a very long time, even at 1,600°C.

#### Accuracy of Measurements

The accuracy of the measurements were between 0.4 and 0.7 per cent. at these high temperatures. The apparatus also contained a device to determine the density of liquids at the temperature of measurement.

Recourse was had in this connexion to the old hydrostatic method. By this apparatus, the surface tension of 200 liquids and 50 molten salts had been determined over a wide range of temperature. With benzene, chlorobenzene, bromobenzene, &c., it was found that the surface tension increased with the atomic weight of the liquid, whereas with molten inorganic salts the surface tension decreased with increasing atomic weight. There was no doubt this was due to the electric change in the atoms which gave this difference in the two classes of compounds.

The result of the experiments was that the surface tension of molten salts was smaller than had previously been supposed, and that these salts must be regarded as completely ionised. The apparatus dealt with individual bubbles and not a stream of bubbles. It had not been possible to apply it to metals.

#### The Concluding Meeting

The concluding meeting of the British Association was held on September 14, in the McEwan Hall, Edinburgh, when, for the first time, the President, Sir Edward Thorpe, was well enough to occupy the chair. He was supported on the platform by the Lord-Provost, the Vice-Chancellor of the University, and other important representatives of the city's activities.

The President said he desired, on behalf of the Association, to express thanks for the hospitality received from the city. Edinburgh and the Association were bound together by many ties, and the present occasion was perhaps as memorable as any that had preceded it. He thought, indeed, that the



meeting would be recorded in the annals of the Association as one of the most striking in its history, for it marked an epoch in the development of science. That they were on the verge of great things they must have been made aware by the remarkable character of the proceedings of the past week. There could be no doubt whatever that science was at the parting of the ways, and that in the immediate future its foundations would undergo fundamental development. From the Lord-Provost and the city's representatives they had received liberal hospitality, and they were indebted also to the Vice-Chancellor and other members of the university for the accommodation that had been placed at their disposal.

Sir Alfred Ewing, Vice-Chancellor and Principal of the University, said the members, he felt sure, would go away realising more fully than before that Edinburgh was a centre of scientific research. When the Association next visited the city and again tackled the problem of the age of the earth, it would be necessary—if the discussion proved as interesting as that of the preceding day—to resort, not to the university's class-room, but the United Free Church Assembly Hall; and if that place were haunted by the shadows of eminent theologians, he thought they would indulge in something like a chortle when they learned how widely different were the conclusions of the positive science of to-day from the equally positive science of yesterday.

Dr. E. H. Griffiths, general treasurer, stated that from the financial point of view the meeting had been an unqualified success. The total membership was 2,768, which had been exceeded only eight times in the 90 years of the Association's existence, and in most of these cases the excess number was very small.

#### Industrial Development of Morocco

WHILST still in its initial stages the industrial development of the French Zone of Morocco continued to make steady progress during 1920, and new departures continued to make their appearance. In his report on the Trade, Industry and Finance of Morocco (H.M. Stationery Office, 2s. net) Mr. G. H. Selous states that the growing need for hydraulic lime and cement resulted in the erection of a hydraulic lime factory at Petitjean, a centre of growing importance owing to its situation at the junction of the Tangier-Fez and Moroccan Coast—Algerian Frontier Railways now in course of construction. The promoter of this undertaking was a cement manufacturing firm of Casablanca, the Société Anonyme des Chaux, Ciments, et Matériaux de Construction du Maroc.

The chief olive oil mill at Marrakesh, Les Huileries and Savonneries Chérifiennes has taken up the manufacture of soap.

In view of the approaching exploitation of the phosphate beds in the Oued Zem—El Boroudj district S.E. of Casablanca, and of the imminent demand for chemical manure by the agricultural industry of the Zone, the Protectorate Government have contracted with a private concern for the production, as soon as the phosphate beds begin to be worked, of 20,000 tons of superphosphates per annum for use within the Protectorate. The future would appear to hold out good prospects for industrial development in this direction.

The mineral resources of the country, whilst still undeveloped, are on the eve of being opened up along what will probably turn out to be the most important mineral line of the Zone, *i.e.*, phosphates. The Administration has hopes of beginning the export of phosphates in the course of the next two years. Two phosphatic areas of such importance have been discovered that Morocco will, it is thought, take a place alongside Florida and Tunis as one of the premier phosphate-producing countries of the world.

The oil possibilities of the Zone continue to hold out great hopes of eventual realisation. Two permits of exploitation have been issued by the Mines Department of the Protectorate Government, and many permits of research have been accorded for prospecting in the area of oil indications which stretches from N.W. of Gibe Tseltats to Fez and Taza. The 1,200 or so research permits which had been issued up to the end of the first quarter of 1921 in the French Zone cover almost every kind of mineral, but only phosphates have as yet been definitely proved to be, as regards both quantity and locality, a commercially exploitable proposition, whilst oil certainly holds out very good hopes.

#### Netherlands East Indies.

##### A Market for Chemicals

H.M. COMMERCIAL AGENT in Batavia (Mr. H. A. N. Bluett) has forwarded to the Department of Overseas Trade the official returns of the imports of chemicals into the Netherlands East Indies for the first two months of 1921. From this return it appears that the total imports of alum during January and February this year amounted to 57,583 kilogs., as against 78,763 for the corresponding period of 1920 and 20,440 in 1919. To the 1921 total Hong-Kong contributed 20,395 kilogs., Great Britain coming second with 16,010 and Holland third with 15,000. Germany supplied 6,000 kilogs. and from Singapore 178 kilogs. were received. The United States, which supplied 17,556 in 1920, supplied nothing this year, and Japan, which supplied 20,260 kilogs. in 1919 and 5,001 in 1920, sent none in 1921.

Next to Norway with 3,000 kilogs., Great Britain with 5,000 was the smallest supplier of calcium carbide in the 1921 period; Germany led with 72,000 and was closely followed by Sweden with 70,000. The United States supplied 44,000 kilogs. The total for the period was 199,100 kilogs. as compared with 55,747 in 1920 and 15,122 in 1919.

A great decrease is apparent in imports of caustic soda, the totals being 415,331 kilogs. in 1919, 561,312 in 1920 and 49,942 in 1921. Great Britain has been the largest supplier except in 1921, the amounts for the three years being 300,074, 374,618 and 20,123 respectively. The United States came next with 112,067, 139,613 and 20,702. Other sources of supply were Holland, British India, Hong-Kong, and Japan.

Over one million kilogs. of sodium carbonate were imported in the 1920 period, of which 765,205 kilogs. were supplied by Great Britain. During the 1921 period, however, the total only reached 22,753, of which Great Britain supplied 19,500, the United States, 2,823, and Holland, 330.

In the two earlier years Japan was the chief supplier of copper sulphate, sending 15,660 (the grand total) in 1919 and 34,440 (out of 35,743) in 1920. In 1921, however, she supplied none and Great Britain sent 28,240, out of a total of 34,512 kilogs.

Imports of iron sulphate, which rose from 1,740 kilogs. in the 1919 period, to 24,205 in 1920, dropped to 10,200 in 1921. Great Britain supplied 24,200 kilogs. in 1920, but sent nothing in the other two years. The whole of the 1921 total came from Germany. With regard to commercial sulphuric acid, of which Japan was the biggest supplier in the two earlier years, the total imports were 94,087 kilogs. in 1919, 65,526 in 1920 and 76,944 in 1921. In the later period Japan's proportion had dwindled to 137, and Holland, which supplied nothing in the earlier years, supplied 76,807. Great Britain exported no sulphuric acid in these periods.

The names of importers of chemicals in the Netherlands East Indies and of United Kingdom advertising contractors may be obtained by United Kingdom manufacturers and suppliers on application to the Department of Overseas Trade, 35, Old Queen Street, Westminster, W.S.1. The reference number, 9744/FW/PN, should be mentioned.

#### Recent Wills

|   |          |
|---|----------|
| Mr. T. M'Arly, of Kilgraston, Kelvinside, Glasgow, and of Pitcairns, Dunning, late of the firm of Messrs. Guthrie & M'Arly, a former chairman of the British Dyewood & Chemical Co..... | £197,786 |
| Mr. Thomas Hall Sissons, of Anlaby, Hull, chairman of Sissons Brothers & Co., Ltd., paint and varnish manufacturers .....   | £65,004  |
| Mr. Thomas Bickle Percy (83), of Homdiscombe House, Plymouth, retired chemist and rennet manufacturer.....  | £24,975  |
| Mr. James Morton (76), of Dunchutha, Helensburgh, dye works manager .....   | £19,555  |

THE VISCOSE CO., of Lewisham, Pa., has recently opened its new plant which, it is stated, will have a production of 6,000 lb. of artificial silk a week for the past month with a gradual increase to about 85,000 lb. The cost of the new works is said to be in the vicinity of \$1,000,000.



## The German Margarine Industry

### Increasing Dutch Control

THE vegetable oil industry in Germany before the war was a very well organised and flourishing business. Enormous quantities of oilseeds and nuts, largely derived from West Africa and other parts of the British Empire, were imported through Hamburg and Bremen, in the neighbourhood of which were well-equipped oil mills for expressing and refining the oil. The resulting oilcake found a ready sale with the German farmers, and the refined oil was exported in large quantities, although a considerable amount was retained in Germany for the manufacture of margarine and for other purposes. But the margarine industry, in common with all other industries dependent on oils and fats, suffered very greatly during the war. A great effort, however, is now being made to restore the industry, new companies are being formed, established companies are considerably increasing their capital, and a powerful trade association has been formed. Output has been largely increased; at the beginning of this year it was estimated at about 35,000 tons per month. Judging from the fact that the amount of raw material imported and allotted to the German Margarine Association has been increased to 100,000 tons per annum, it would seem that the vegetable oil import trade in Germany is also expanding. Of course, this amount of raw material—assuming it to be oil and not oilseed—would not be nearly enough for an output of 35,000 tons a month, and this latter figure indeed seems exaggerated. If the 100,000 tons represent oilseed then at the best it could not mean more than 50,000 tons oil, probably much less, and the disparity would be still greater. The imported material would, however, be largely supplemented by home produced animal fats, of which large quantities are used in German margarine, and attempts are also being made to increase the acreage and yield of home-grown oilseeds, *e.g.*, rape, linseed and sunflower. The margarine industry is now practically free from Government control, except that the War Committee has large stocks in hand of oils bought at inflated price and wishes to unload these on the margarine industry.

### New Companies

There are now about 170 margarine manufacturers in Germany, and several new works are being planned. But it is estimated that the bulk of the production (75 to 80 per cent.) is in the hands of the two Dutch-English firms, Jurgens and Van den Bergh and their associated companies, also that 50 per cent. of the oil-milling industry is controlled by foreign capital. The Dutch firms' ramifications are far-reaching and include virtual control of the enormous oilseed resources of the Dutch East Indies. Two of the largest oilmills in Germany have recently amalgamated, namely, the Oel-fab. Gross-Gerau and the B.B.O (Bremen-Besigheimer Oelfabrik), and they will probably be associated with the Dutch firms if they have not already done so. Moreover, there may ultimately be some arrangement between the Dutch interests and the firms included in the German Margarine Association, but at present competition between the two is keen. The following list gives some of the more important new companies and increases in capital of established companies:—

Westfälisch Sussrahm Margarinewerke J. Eyck G.m.b.H., of Herford, capital 200,000 marks, to manufacture margarine and artificial honey.

Rheinische Marg.-Fab. Ernst & Blecker G.m.b.H., of Duisberg, capital 100,000 marks.

The Sana Ges., a branch of the Cleve firm (controlled by Van den Bergh), 250,000 marks, to manufacture and trade in milk-free butter substitute, and to manufacture margarine from almond milk and dairy milk, edible fats, &c.

### Capital Increases

A. L. Mohr G.m.b.H., of Bahrenfeld, increased from 2 million to 10 million marks.

Jurgens & Prinzen, Herford, 2 million to 10 million marks, the new shares being taken by the German Jurgens-werke A.G. Hamburg.

Krefeld Marg.-Werke (J. C. Uhlenbrök), 1.5 million to 4 million marks.

The Bergisch Märkische Margarinewerke (F. A. Isserstedt A.G. of Elberfeld), 1.5 million to 15 million marks. Has purchased a large site in Berlin-Pichelsdorf for the erection of another

margarine factory; or an existing large brewery may be converted to margarine manufacture.

Margarine-Werke, Dr. A. Schröder A.G., 6 million to 12 million marks.

A. G. Maga (Food & Vegetable Butter Works), 100,000 to 1.5 million marks.

S. & G. Müller Speisefettwerke (edible fats), 2.8 to 5.6 million marks. This firm paid a dividend in 1920 of 20 per cent., and a bonus of 10 per cent., *i.e.*, 15 per cent. on the doubled capital. It is now said to be largely under Dutch control.

Stettiner Ölwerke A. G., 6 million to 18 million marks.

The great firm of Jurgens in Holland, the Dutch style of the firm being Anton Jurgens Vereenigdefabrieken, with headquarters at Oss, is the largest manufacturing enterprise in Holland. It has grown very rapidly since 1910, and its total capital is 186,000,000 florins, of which more than half is paid up. Following the example of many large English and American concerns the capital is divided into several classes. The dividend on the ordinary shares, of which there are 60,000,000, was 15 per cent. in 1918, and 25 per cent. for each of the three previous years. The firm is interested in over eighty different undertakings in all parts of the world, including the United Kingdom, France, Belgium, Germany, Scandinavia, North and South America, and the Dutch East Indies. At present it controls ten oil mills and margarine works in Germany, with a total capital of nearly 14,000,000 marks, beside numerous selling organisations in Berlin and elsewhere. According to a recent German report its chief manufacturing activities are in England, where it is said to have eclipsed the largest English firm engaged in margarine manufacture. The English Jurgens has several subsidiaries, including the Selby Warehouse & Transport Co., and Van Ardol, Ltd., and its total capital, according to the same German report, is £12,500,000. In Holland its largest associated company is the Stearinekerzenfab. (candle works) at Gouda, with a capital of 12,800,000 florins, and paying a dividend the last few years of 35 per cent. It is anticipated in Germany that Jurgens & Co. will still further extend its operations in that country, but it is pointed out that this will be of advantage, since Germany will be thereby assured of a plentiful supply of oils and fats, which, otherwise, would be difficult to obtain.

Van den Bergh are also extending their operations. They control various margarine works in Germany, including large works at Cleve and Mannheim; and in co-operation with the Centra works at Tetschen they are opening a new factory in Czecho-Slovakia, with a daily output of 50 tons.

Prices of margarine in Germany are gradually declining. The wholesale price in November, 1920, was about 12.75 marks per pound, and is now between 8 and 10 marks per pound.

### Need for Research

It has been stated in Germany rather frequently of late years that the oils and fats and allied industries, particularly those connected with soap and margarine manufacture, have not given sufficient attention to scientific research, and have been too empirical and old-fashioned in their methods. It is pointed out that this is in marked contrast to the great dye industry, which owed much of its world-wide success to scientific research. Oils and fats offer an equally wide field for investigation, and much yet remains to be done in the study of oil-refining, fat-hardening or hydrogenation, margarine manufacture, etc. Other countries, it is observed, especially England and the U.S.A., are taking up this important research very thoroughly, and Germany must do the same. There has been in Germany for some years a Wissenschaftliche Zentralstelle für Oel u. Fettforschung (Oils and Fats Research Institute), but it has suffered from lack of funds and encouragement. Serious efforts are now being made to remedy this state of affairs, and it is all the more important from the point of view of manufacturers of edible fats and margarine. In most countries there has now developed a keen competition between soap-makers and margarine makers for the available supplies of raw material. The margarine makers will probably have the best of it, owing to the great improvements recently made in processes of oil refining and fat hardening, whereby the oil is made suitable for edible purposes, and is too high-priced for soap making. The soap makers will have to be content with the lower grades of oils and fats, chiefly fish oils, if the demand for margarine and edible fats generally increases much more; and they are already endeavouring to find substitutes for fat—*e.g.*, clay and other substances. A certain amount of atten-

tion is being given to the possibility of increasing the yield of home-grown oil-seed crops in Germany, and this takes a prominent place in the programme of the Oils and Fats Research Institute. Another interesting development is the artificial synthesis of fat by the oxidation of hydrocarbons—e.g., paraffin and other mineral oil derivatives, and also from coal-tar distillates, so that the manufacture of soap or even margarine from coal is not so impossible as it appears! Yet another important investigation is that connected with vitamins or accessory factors of which so much has been heard lately, especially in the medical and biochemical journals when dealing with food and nutrition. It is generally assumed that these essential factors are not present in margarine made from vegetable oils, although they are abundant in butter, and therefore the problem of introducing them into margarine is a very important one if margarine is to be a real substitute for butter.

Latest information from Germany now confirms the anticipations expressed above that the section of the German margarine industry under Dutch control would eventually co-operate with the remainder of the industry. Negotiations between representatives of both sections meeting at Berlin have resulted in an agreement to form one "Margarineverband E.V.," representing the interests of the whole German margarine industry and trade, equal rights and privileges being accorded to the firms under the control of Jurgens and van den Bergh, on the one hand, and the "non-combine" firms on the other. Among the directors of the new margarine association—which also embraces manufacture and trade in edible fats—are L. van den Bergh, of Berlin, and Emil Jurgens, of Altona, and its headquarters are in Berlin. The old Margarineverband G.m.b.H., representing only the "non-combine" firms has been dissolved.

## B.A.C. Unemployment Benefit Fund

(FROM A CORRESPONDENT)

MEMBERS of the British Association of Chemists will have observed among the objects of the Association as set out in Section II. (h) of its Rules, that of helping those members of the Association who may be in necessitous circumstances. In order to give effect to this object a draft scheme for the inauguration of a Benevolent Fund was placed before the Council shortly after the last Annual Meeting, and after discussion of the whole question a Committee was appointed to deal with the matter.

At the following Council Meeting the Committee submitted a Report, embodying as an alternative a scheme for the institution of an Unemployment Benefit Fund. The Committee pointed out that a Benevolent Fund had already been inaugurated and was being worked by the Institute of Chemistry, and in consequence a Benevolent Fund as now contemplated by the B.A.C. would to a great extent overlap that scheme. If, moreover, the scheme were made obligatory, although it would benefit those members of the B.A.C. who are not members of the Institute of Chemistry, it would bear hardly on those who are members of both bodies as they would be liable to a double subscription.

The scheme outlined by the Committee as an alternative to the Benevolent Fund would in their opinion be more effective in carrying out the provisions of Rule II. (h), viz: "To maintain funds . . . for the relief of members when unemployed, sick, victimised or in distress."

The Committee point out that the professional man, unlike the manual worker, has at present no fund to fall back upon when he is unemployed, while the high cost of living and professional expenses leave him little opportunity to accumulate savings sufficient to meet such an emergency adequately. They recommend that the scheme should be obligatory and not voluntary. No scruples as to receiving charity could arise in a scheme which required every member of the Association to contribute a definite amount per annum to an Unemployment Fund on which a Member felt he was entitled to draw when he found himself without employment. Such a scheme moreover would help to prevent an unemployed member taking a post at a salary insufficient to enable him to maintain his professional status. Some few members of the Association drawing high salaries might object to contributing to such a scheme on

account of security from unemployment, but the majority of the high-salaried members are the very members who would subscribe liberally to a Benevolent Scheme.

The Committee subsequently, in accordance with the Council's instructions, proceeded to obtain actuarial opinion on the scheme they had outlined. At the Council Meeting held on July 2 the Committee reported that in the opinion of the experts consulted, the scheme was sound as far as they could judge from the figures submitted, and the Council agreed thereupon to place the scheme before the Members of the Association for criticism and suggestions.

The Unemployment Scheme devised by the Committee is one based on a "Unit" system, and the benefits paid vary in accordance with the number of units for which the member subscribes. Subscriptions to the fund are payable in advance, and either monthly or quarterly at the option of the member. The subscription for one unit of benefit is intended to be compulsory for every member of the Association holding a salaried appointment. This subscription unit, of one shilling per calendar month, entitles any member joining the Association below the age of 41 to a payment of twenty shillings per week for any one period not exceeding twenty-six weeks of unemployment, or for a total period not exceeding twenty-six weeks in any two years. Members joining at the age of 41 or over receive benefits on a slightly reduced scale. The maximum number of units for which a member may subscribe varies from 3 units in the case of those joining between the ages of 21 and 30, to six units for those joining between 47 and 60.

No benefits are payable during the first month of unemployment, and members must give immediate notice of their becoming unemployed. In order to provide a nucleus for the Fund no benefits will be paid during the first six months of the operation of the scheme. Members become eligible for benefits six months from the date of the first units subscribed. Additional units taken up at a later date will not entitle members to benefit in respect of such additional units until the same period has elapsed.

Members will not be required to pay subscriptions to the Fund during the period of their unemployment. The scheme provides for the maintenance of a Special Reserve Fund equal to twelve months' income and an ordinary Working Fund equal to not less than six months' subscriptions before any division of profits (or bonus) is made to members. At the end of every third year, after the Auditors have certified that the necessary Reserve Funds have been provided, 75 per cent. of any surplus may be divided as a cash bonus, proportionately to the units subscribed for, among the members who have made no claims during the previous three years. The scheme also empowers the Council, if necessary, to increase the unit subscription by an amount not exceeding 25 per cent. should the drawings on the Working Fund for a period of three to six months exceed 75 per cent. of the estimated income for that period.

## New Welsh Industries

LAST week saw the commencement of a new enterprise in South Wales, states a correspondent of THE CHEMICAL AGE. For years the leaders of the industry and the industrial chemists have addressed themselves to the problem of the economic utilisation of the mountains of colliery and other similar waste which lie in the Welsh valleys in many millions of tons. A company has been formed, in which Messrs. Ettinshaw, of Wolverhampton, and Guest, Keen & Nettlefold, Ltd., are associated, and works established at the base of the Dowlais steel works tip, which contains from two and a-half to three million tons of cold blast furnace slag, to convert this material into concrete slabs for building purposes and into a tar-macadam product for road-making. Plant has been installed, railway sidings provided, and on September 17 the machinery delivered its first truck-load of the product, an immediate output of 4,000 tons of which per week is estimated. It is anticipated that the new industry will develop into an extensive one, employing a considerable number of workmen. The works buildings, it is interesting to note, have been constructed for the most part of materials produced at the works.

A further report states that Messrs. John Freakley & Co., of Dudley Port, have taken over the old slag tips at Acrefair, Denbighshire, for a similar purpose.

## Great German Chemical Works Explosion

Oppau Factory of the Badische Company Destroyed

A TERRIBLE explosion occurred early on Wednesday morning at the factory of the Badische Anilin und Sodafabrik, at Oppau, as a result of which casualties in the vicinity of 2,500 are reported to have been sustained. Of this number it is thought that no fewer than 1,000 people were killed. The force of the explosion was felt over a large area, causing severe damage in Mannheim, Ludwigshafen and other neighbouring towns, and it has been stated that its effects were felt at Frankfurt, which is some thirty-seven miles distant from Oppau.

Although various theories have been advanced, nothing definite is known as to the cause of the accident. As far as can be ascertained at present, there were a series of explosions, the first of which occurred in one of the laboratories. Two gasholders situated near this laboratory were blown up, their site being marked by a crater about 400 feet wide, and about 100 feet deep.

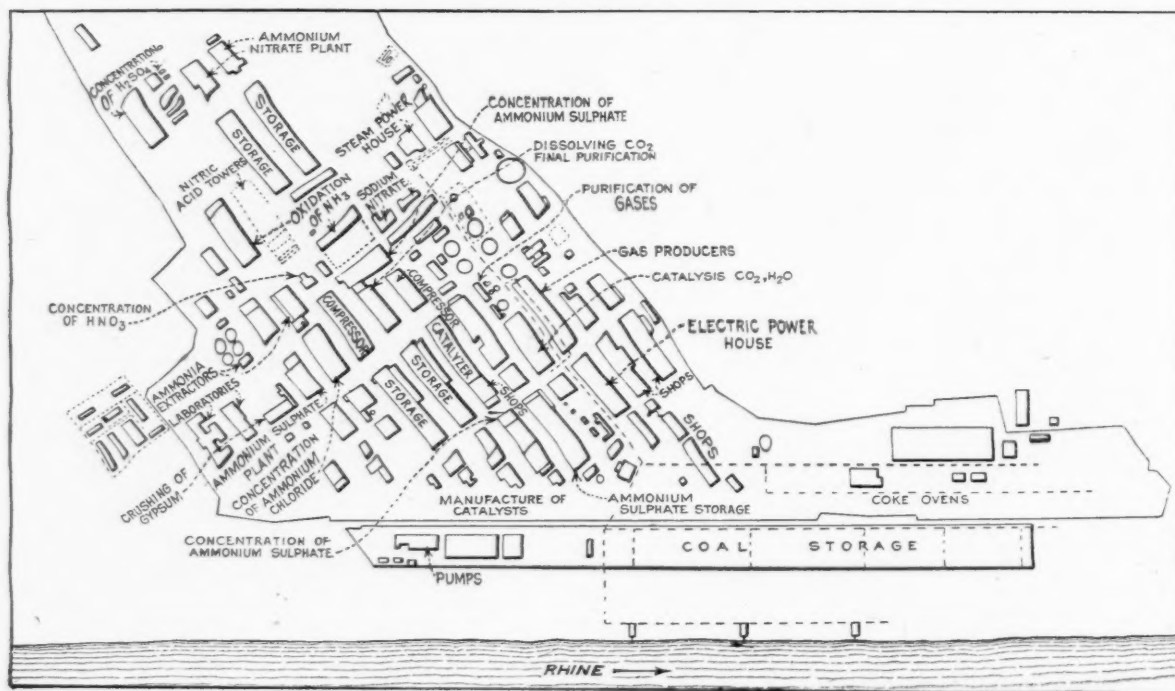
The Oppau Works, it will be remembered, were built in 1913, and were subsequently enlarged to allow of the production of

were taken prior to the preparation and storage of these products that they believed all danger of explosion to be excluded.

The Oppau Works were constructed as a completely self-contained unit, and in addition to the usual departments had supplementary plants for the manufacture of catalysts, coke ovens, motive power, coal-handling and water supply. There were also a number of special shops for forging, turning, building, &c., and the only things of outside make were heavy forgings, electric motors and steam engines.

The plant, a plan of which is shown on this page, occupied an area of about 2,000 acres. Its construction was begun in 1912, and owing to the small resistance of the soil it was found necessary to go to a depth of 55 feet to find a solid basis for the foundations. Pipe lines for gas, steam and various solutions were laid all over the plant, both overhead and underground.

Great ingenuity was exercised in reducing manual labour in the plant to a minimum. Every shop was provided with



PLAN OF THE OPPAU WORKS OF THE BADISCHE COMPANY.

synthetic ammonia from nitrogen and hydrogen under the Haber process. Together with a plant at Merseburg the Oppau Works was merged into the Nitrogen Trust, and since 1920 has been under the control of the Ammoniak Werke Merseburg Oppau. According to the statistical supplement to the Final Report of the Nitrogen Products Committee of the Ministry of Munitions, the Oppau plant in 1914 had an output of 25 metric tons of synthetic ammonia per day, rising to 220 tons in 1918, and 250 tons in 1920. The Merseburg plant commenced in 1918 with a daily output of 400 metric tons, which, it was estimated, would be increased to 800 tons when the plant was completed. Assuming 95 per cent. continuous operation the approximate maximum annual output, calculated in metric tons of sulphate, was 35,000 in 1914, 850,000 in 1918, and 1,500,000 in 1920.

The directors of the Badische Company have issued a statement in which they express the opinion that the explosion occurred in a warehouse containing about 200 tons of ammonia compounds. They further state that such rigid precautions

cranes and electrically operated hoists, and solid materials were transported in special trucks with automatic discharge, or by belt conveyer, endless screws or bucket elevators.

Measuring instruments connected to observation boards, under the supervision of an overseer, were employed in all manufacturing processes, and by these and other similar means it was possible to conduct this enormous plant with the relatively small personnel of 5,000. The original cost of the plant was 300,000,000 marks.

The material damage is estimated at 150,000,000 marks, equal to £375,000 at the present rate of exchange.

A hill of COPPER SULPHIDES measuring 80 ft. above the water level of Lake Athapapuskow, Manitoba, is reported to have been found by two prospectors. An expert is of the opinion that the hill is one solid mass of sulphide throughout. The samples shown are said to be high-grade and miners think it is running to 20 per cent. copper, with small gold and silver values.



## Reduction of Prices

By Ernest J. P. Benn

A GREAT many things must happen before trade and commerce get back to what we still fondly describe as the normal, although very few business men really remember what that ideal condition is like. The trouble is that these things take long in the happening, and, on the whole, we are not inclined to act on theory or on reason, but insist upon waiting for practical experience to guide us. This is a tedious process and we are all suffering in consequence. It has for more than two years been evident that wages must fall, and yet we have insisted upon increasing them still further, and it is only now when we are faced with unemployment on an unprecedented scale that public opinion as a whole is prepared to sanction an all-round reduction in the rates of wages. If reason had prevailed a couple of years ago, and we had all done that which was obviously right, we should be busy to-day and there would be no unemployment, but we preferred to learn our lesson laboriously. Similarly, if wisdom had prevailed on the declaration of peace, the whole of the inter-allied indebtedness would have been cancelled. It is open to argument that the whole of international indebtedness as between Governments ought to have been cancelled. Mr. Keynes told us so years ago, but we are not yet ready to listen to him.

Again, public and private waste ought to have been stopped the moment the war ended. Everybody knows the theory of the matter, and everybody agrees, but so weak is our wisdom when we act collectively that we shall go on wasting until we are brought face to face with the actualities of bankruptcy and then we shall begin to economise. In December, 1918, instead of wasting our time in a General Election we should have been busy closing up war departments, and getting the Government out of business. We have been dawdling with the question for nearly three years and will, no doubt, dawdle with it for another couple of years until nobody can be left with an atom of doubt as to the frightfully damaging effect of the presence of any Government in any market, and then, and not till then, we shall get freedom from Government interference in business.

### Lower Prices Yet

But there are many other things which require to be done in connexion with the process of getting back to the normal which are in the hands of traders as individuals, which do not rely upon that weak form of wisdom which acts through authority, and which can be attended to forthwith. The biggest field for activity in this way is in connexion with prices. Prices have been coming down for a year past; prices have to come down still further and the quicker that process is completed, the quicker will trade revive. Nobody knowingly buys on a falling market, unless he can be sure of selling at once. All incentive to buy disappears the moment there is any suspicion as to the equity of the price asked. There will be no rush to buy until the impression prevails that prices are somewhere near a reasonable bottom or at least at a point where they are likely to remain for some time to come.

In these circumstances, the business man who is wise puts his every thought into the problem as to how he can reduce his prices. Every five per cent. off the price of anything to-day is a definite service to the community as a whole, not excluding the producer: indeed it is arguable that there may be greater benefit to the producer from a price reduction than the monetary advantage which immediately accrues to the consumer. In the days before the war, which we think of as normal, price cutting was a reprehensible practice. It had reached a point where it threatened the life of some of our industries; it had, indeed, to be held in check by a definite movement in favour of price maintenance. But to-day the position is entirely and utterly different, and the tradesman who can reduce the price of anything by a small percentage is rendering a definite service to himself and his class as well as to the rest of us.

### Why Prices Have Risen

This question is worthy of systematic and complete study on the part of everyone in trade. The best way to approach it is to reconstruct the history of the last seven years and set out a list of the numerous things which have happened to cause prices to rise. From such a list it will be possible to get

an impression of the things that must happen to induce the reverse process. It does not follow that the tradesman must wait for things to happen: it may even become evident that the first move is with him. Many a tradesman has, during the war, increased his percentage rate of profits in order to make up for the diminution in the quantity turnover by rationing, or other restrictions. That was a perfectly legitimate process: indeed, without it, few tradesmen would have been able to keep their doors open. But it is obviously useless to wait for the old rate of turnover to return before reducing the percentage rate of profits to the pre-war level. That would be putting the cart before the horse. Many a retailer has now to face this problem fairly and squarely. His old-time circumstances demanded that he should have a 10 per cent. out of a normal of £1,000 worth of trade which he could rely upon doing. Then came the war, with limitations, and the £1,000 worth of goods were knocked down to £500 worth. It then became necessary for the tradesman, in order to meet his overhead and other charges, to secure his £100 out of the lower turnover. The next process must be started by him, he must straight away cut his rate of profit, having the faith to believe that by thus doing he will surely if slowly get his old turnover back.

### Frankness Between Tradesman and Customer

The all-important thing for the tradesman to-day, whether wholesale or retail, is to secure the good will of his customers, and this will not be gained so long as there is any ground for the suggestion that profits are extravagant or exorbitant. In many trades there is in progress at the present moment a process of wholesale shuffling of accounts. What a mad scheme it is! Buyers are searching for reductions in prices, sellers are loath to give them. Buyers do not care to jeopardise their good relations with existing suppliers by insisting upon reductions, so they seek quotations elsewhere. A is buying of B, and C is buying of D. A asks D for a price, and secures a quotation framed in the hope of getting a new account well below the present market rate. C asks B for prices and is quoted in the same foolish manner; the result is a shuffle, B loses the A account, and gains the C account, C loses the D account and opens up with A. All four parties entertain a grievance against at least one of the others, a great deal of trouble is caused, and prices are brought down. How much simpler and better it would be if B and D each in his own individual capacity had the pluck to go to their respective customers, A and C, and say that they recognised the new circumstances of the moment and had arranged to reduce prices.

The incentive given to business by the display of such wisdom would be invaluable: buyers treated in such a way would feel under an obligation to buy to the limit, would strain every nerve to increase their capacity to buy, and would redouble their efforts to pass on the trade and thus create a general improvement. All the inflation, all the padding, all the profiteering have to be squeezed out of our business before we can talk about the normal, before we can feel that we are on a firm foundation, before we can regain that confidence which will enable us to extend and expand. Why not, therefore, let us each make it our own individual business to do our own squeezing, and not wait for the pressure of outside forces which will rob us of our good will and incidentally delay the trade revival which is to-day so badly needed? There are many ways of reducing prices. It is not always necessary to make a shilling tennence. Prices have been increased by reduction in values and reduction in quantities, standard sizes have been made smaller, cheaper materials have been introduced, quality has sometimes had to go down. All these war-time expedients must be given up some day or another. The tangle into which the threads of business have been wound must be unravelled, and it is up to each of us to see that we do our little bit of that process and do it without delay.

The discovery of a large body of high grade HEMATITE IRON ORE in the Elk Lake district of Northern Ontario has been reported. Iron was not expected to be found in paying quantities in that district. Much of the iron ore in the great range of which the Atikokan and Moose Mountains deposits are a part is of 50 per cent. metallic content, but contains other elements that render necessary special blast furnace treatment.

## Security in Handling Inflammable Liquids

(From a Correspondent)

ONE of the great difficulties and dangers in modern garage work is the storage of petrol, oil and other inflammable liquids, the chief of them being petrol.

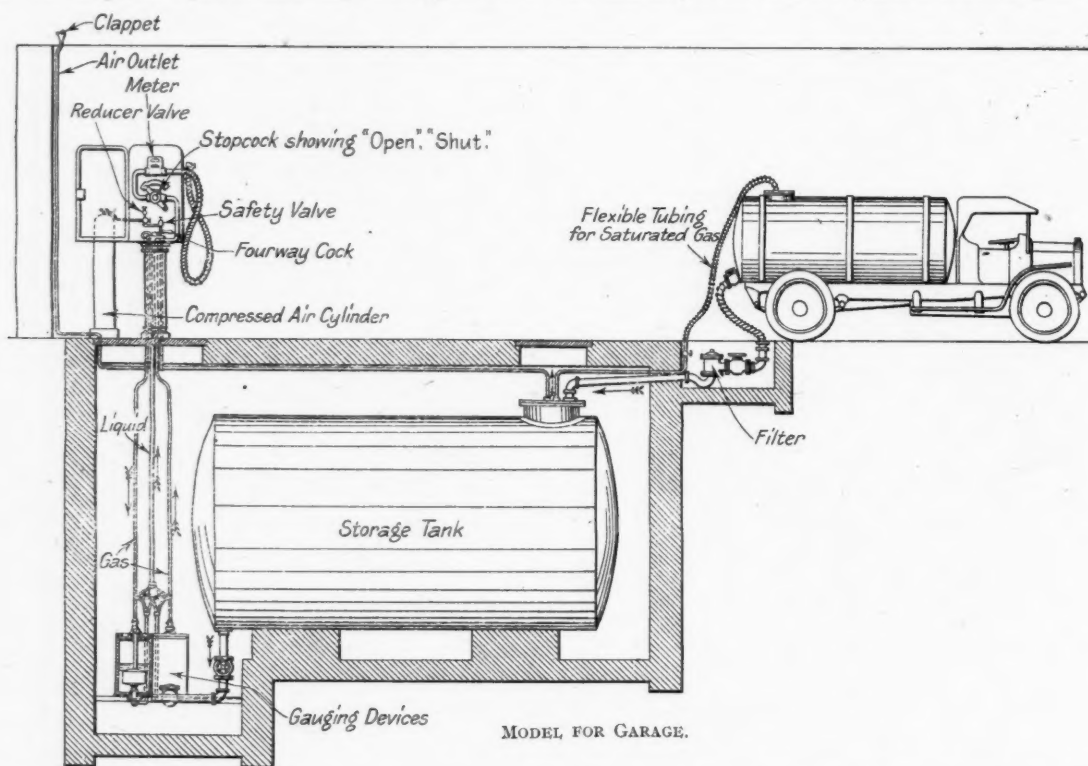
Owing to its being so extremely volatile, petrol is always in a state of evaporation, the vapours being of a highly explosive nature when mixed with air. The problem is, therefore, to store the liquid in such a way as to isolate it completely from the outside air until it finds its way into the petrol tank of the car. Furthermore, if, in isolating the petrol, one could cover it, so to speak, with a layer of a neutral non-inflammable gas, practically all the dangerous qualities of petrol or other inflammable liquids are removed.

There are many systems for the storing and distribution of petrol. Pumping, in any case, is wasteful, this being due to the wear and tear of moving parts, causing leakage and inaccurate delivery; pumps also require more mechanical power. To keep the liquid continuously under pressure is

### A French Invention

This has been realised in France by the invention of an engineer, Captain Maucière, Expert to the French Government during the war. Not only does his invention permit the storage and protection of the petrol, but also the distribution either in a continuous flow or in predetermined quantities. This is done by the use of a compressed neutral gas or air.

The accompanying diagram shows a normal installation for a garage. The storage tank is filled by gravity at atmospheric pressure, the petrol never coming into contact with the outside air, because, as the reservoir is being filled, the gases from the reservoir pass into the wagon. On the left of the reservoir are the two gauging devices which are the principal object of the invention. These are intercommunicating and are also connected to the reservoir. They are emptied and filled alternately by means of neutral gas (carbon dioxide, for instance) or air at a low pressure circulating in a closed



very expensive, the tank has to be of special construction, and there is always, owing to pressure, a certain amount of vapour which manages to percolate to the outside air. To maintain a continuous pressure in a large tank entails a large plant and complicates the arrangements for filling.

It is also practically impossible to lubricate a pump for petrol, as petrol is a solvent for all oils and greases. This causes loss of suction power and the friction of moving parts heats the liquid and might become dangerous.

Most pumping apparatus use the cylinder as a measuring unit, but accuracy cannot be guaranteed owing to wear and tear on the parts. Again, petrol is shaken up, bubbles and froths increasing the inaccuracy of delivery and causing trouble in long pipes.

It may also happen that the main reservoir is some distance from the supply post, and pumping operations are therefore less efficient and more costly. Neither is it advisable to install electrical machinery too near the tanks, owing to the extremely inflammable vapours surrounding them.

The problem is, therefore, to be able to store the petrol at atmospheric pressure protected by inert gases, to distribute it pneumatically, and to avoid any contact with the outside air.

circuit, and while one is being emptied the other is being filled. This alternation is effected by a four-way cock on the control board, and which may be manipulated by hand or automatically. The gas under pressure (8 or 9 lb. per square in.), alternating between these two containers, raises the petrol to the control board, which afterwards passes through the meter and out to the consumer. The whole of this operation is performed without the petrol coming into contact with the air. When the apparatus is idle, the pressure is automatically cut off, the two containers returning to atmospheric pressure.

The power required is compressed gas or air either from cylinders or from a hand or electrically operated compressor, which may be installed in any part of the building. The power required is  $\frac{1}{2}$  H.P. This gas cylinder or compressor is connected to the control board through a reducer and safety valve.

The control board is equipped with a special pneumatic gauge indicating the exact quantity of petrol in the reservoir; the reducer valve, safety valve, and the four-way cock commanding the two containers. This cock may be controlled by hand or automatically. Lastly, there is the meter, which records the amount of petrol delivered and also may be

arranged to deliver any predetermined quantity. When this quantity has been delivered the apparatus automatically stops working and the pressure in the containers drops to atmospheric.

There are two main types of apparatus, the first for small installations where the gases are not recuperated, and the second which recuperates the gas in the circuit. The accuracy of delivery in this process is guaranteed to 1 per cent.

From the point of view of insurance, this process should be very advantageous. Actually the French authorities have authorised a reduction of 50 per cent. for small installations and 75 per cent. for large ones on insurance premiums for users of the system, the danger from fire being reduced to a minimum.

The absence of mechanical appliances such as pumps and the simplicity of control render the apparatus practically fool proof. The fact that the main reservoir is always at atmospheric pressure completely removes any sources of accident and makes it possible to install the system with existing plant, whether the tanks are underground or on the surface.

I have seen this apparatus at work on one of the big Paris garages (400 cars), and it is in continuous operation for large and small quantities of petrol. The drivers have complete confidence in the meter system, as they are absolutely sure of getting the exact quantity ordered, which is not always the case with the stoppered tins. Also, owing to the system of filtration, they are doubly sure that the petrol is pure. Every drop that goes through the machine is recorded and accounted for.

#### Two Installations

In conclusion, I may give a few particulars as to the installations at La Courneuve Duguy (Seine) (840,000 galls.) and at Metz (300,000 galls.).

These installations supply and ration petrol or oils by railway tank wagons, lorries, barrels and tins. All these operations are conducted automatically, and, if required, simultaneously, the liquid delivered never coming into contact with the air during the entire operation.

The Metz Military Depot deserves special attention. The 14 underground reservoirs were built during the war by the German army. The manipulation of the petrol was effected by the Martini and Huncke system. When the French, however, reoccupied Metz they took over the whole installation and scrapped the German distribution apparatus, replacing it by the Maucière patents. The advantages of this system are an increased delivery, no loss of neutral gas and the complete absence of complicated pumping machinery, all the mechanical energy required being a compressor for the gas.

This apparatus is also used in France for roadside supply posts, the same machine supplying oil, petrol, water, and even compressed air for pumping up tyres. In fact, this system can be put to almost any use as far as the manipulation of liquid is concerned, and should be of considerable interest to the Admiralty, War Office, Air forces, and the large oil companies, motor-bus companies, taxi-cab companies, &c., &c.

## Institution of British Foundrymen

### Annual Conference at Blackpool

THE eighteenth annual conference of the Institution of British Foundrymen was held at Blackpool on September 14 and 15. Mr. Oliver Stubbs, of Messrs. Joseph Stubbs, Ltd., Manchester, was elected President for the year, Mr. H. I. Reason (Birmingham), senior Vice-President, and Mr. J. Jewson (East Dereham) junior Vice-President.

The President announced that the National Ironfounding Employers' Federation had decided to set aside a sum not exceeding £200 to be vested in trustees and the proceeds applied to the provision of a medal to be awarded upon terms and conditions arranged by the Institution. Mr. M. Riddell, the retiring President, added that Mr. W. Mayer, of Dumbarton, had vested with trustees the rents arising from a piece of land in Glasgow, estimated at about £26 per annum, which would be applied in providing a gold medal and a silver medal to be competed for by the members of the Newcastle and Scottish Branches of the Institution.

#### Value of Research

In his presidential address Mr. Stubbs urged the necessity for co-operation between the employer and his workpeople.

In the past the foundry industry had not been an attractive one and it was essential to improve the conditions under which the men worked. Strict attention must be given to the efficient training of apprentices and the continuation of their education needed very careful consideration. Pressure should be brought to bear upon employers to select their managerial staff from members of the Institution. Free discussion and consultation between the various departments would prevent many difficulties. The war had brought people to realise the value of research to industry and the closest association now existed between the scientist and the producer; the formation of the British Cast Iron Association must be extremely gratifying to the members, as it was largely due to the interest they took in the matter. Beneficial results had already been secured by the work of the Association and researches into 15 subjects were being prosecuted. Whole-hearted support and assistance must be given to the foundry industry if this country's position in the world's markets was to be maintained. The present annual output of 66,000 tons was less than the output some years ago.

### Basic Hearth Electric Furnaces

A paper by Mr. G. K. Elliott, of Cincinnati, U.S.A., entitled "The Basic Hearth Electric Furnace and some Problems of Cast Iron," was read by Mr. T. D. Robertson (London). It advocated the use of the electric furnace as an adjunct or in conjunction with the cupola. The latter was the best and most economical furnace for melting, but it was faulty as a superheater. On the other hand, the electric furnace could superheat the lowest phosphorus iron sufficiently to make its fluidity equal to the tests of running out the smallest and thinnest section castings. It was a remedy for poor coke. In the duplexing process any coke capable of melting pig iron or scrap in the cupola sufficiently for it to be transferred to the electric furnace could be used with impunity because shortcomings were set right in the electric furnace. A peculiarly interesting feature was its refining power. In that respect it was most potent and the opposite of the cupola.

### Eliminating Sulphur

It offered a ready method of ridding cast iron of most of its sulphur. This was of vast importance because the accumulations of sulphur in the world's scrap heap was becoming a problem. Every remelting increased the sulphur. His opinion was that if the sulphur was below .07 per cent. it could not be considered dangerous in any ordinary grey-iron casting; above that segregation was likely to occur with harmful results. An indirect benefit from reduced sulphur was a saving of manganese. All the harmful effects of oxidation in the cupola were done away with.

In the course of the discussion Mr. J. R. Hyde (Sheffield) suggested that the improvement of the metal with the electric furnace was due to the higher casting temperature which was obtained. Mr. V. C. Faulkner (London) said the electric furnace was bound to be generally accepted in the foundry, the only difficulty being the question of cost. Mr. H. J. Young (Wallsend-on-Tyne) said his experience, based on analysis in duplicate of over a thousand pairs of "arbitration" test bars, was that 343 contained .140 or more of sulphur, which was twice as much as Mr. Elliott said was consistent with safety. The sulphur content in scrap could not increase indefinitely; there were limits to it, and it was very difficult to get over .2 per cent. and up to that point there was no real danger. The evidence did not support the theory of the merits of low sulphur.

Mr. Robertson, in reply, said the initial cost was a serious matter, but the operating costs were not so high as was imagined, and it was possible to use cheaper mixtures. Conditions in this country were different from those in America. There was no water power, and current had to be generated with dear coal, so that the average cost was two or three times that in America. The other costs—labour, material, electrodes and repairs—should be covered by 10s. to 15s. per ton. If the desired results could be obtained by improving cupola practice the field for the electric furnace was small, but if castings could not be made cheaply and well it should be brought in to aid the cupola.

### Perplexing Foundry Problems

Mr. J. H. Shaw (Sheffield) read a paper upon "Some Perplexing Foundry Problems," in which he said there were questions on which foundrymen were quite at sea. Could



oxygen be found in appreciable quantities in an iron whose chemical analysis would mark it as suitable for making strong grey-iron castings? If so, was it beneficial or otherwise? In some pig irons the fracture did not conform to what might be expected from their analyses. Was it not possible that large quantities of pig iron possessed these inherent qualities in a lesser degree? Might not this account for some of the divergences between chemical tests and chemical composition? In view of the fact that America, Germany and Italy had adopted the transverse test as a standard with the tensile test in most cases optional, was there any evidence that the former gave a better idea of the quality of the iron?

Mr. H. J. Young stated that the analysis of cast iron was most difficult. Besides the variations in the constituents, differences in the melting, pouring, moulding and machine affected the final result. Ordinary analysis was not to be trusted; he would have an important sample analysed five or six times by several methods, but even then the results were not convincing. Irons which produced castings that were not what one expected were regarded as freaks, but if they were followed up it would probably be found that they had definite qualities.

Mr. Shaw, in replying, said the founder received metal which, although similar in analysis, varied in its quality. That variation was not due to the ore, but arose in the blast furnace.

## Agricultural Research—II

### Its Attractiveness as a Career

IN a previous article (THE CHEMICAL AGE, July 30) some account was given of the scope and variety of agricultural research from the chemist's point of view. It now remains to consider the very important practical question: What are the possibilities and incentives of agricultural research as a career for the ambitious young chemist? The Ministry of Agriculture has rightly appreciated the importance of research generally in our greatest industry, Agriculture, and has consequently also realised that the vital and urgent question of the world's food supply—becoming more vital and urgent with each succeeding generation of human beings on this planet—will very largely depend on scientific research, especially chemical research. But this particular branch of practical science, like all others, has hitherto been seriously hampered by the poor prospects offered; for the research worker, however much he may love his work, must live, and, being human, appreciates encouragement in a material form. Otherwise he feels that all his efforts have been in vain if the industry with which he is connected cannot, despite the improved and cheaper methods for which he is largely responsible, afford reasonable remuneration to those very workers to whom the more efficient and economical working is largely due. It is this which causes the iron to enter into his soul. Whether or not the Ministry of Agriculture has concerned itself very much about the chemist's soul it has certainly given some consideration to his mere material or creature comforts, and has just recently evolved a scheme for attracting and retaining talented workers whereby a definite career will be open to the men and women engaged at the Agricultural Research Institutes in England and Wales. These institutes are usually attached to some university or college, except the great Rothamsted Experimental Station at Harpenden in Hertfordshire. Some account of these various institutes and their work was given in the previous article, and it may here be added that the members of the scientific staffs are recruited chiefly from young graduates who have taken honours in natural science and specialised in some branch of science having an agricultural bearing, frequently with the aid of a research scholarship granted by the Ministry. These scholarships constitute therefore the very important first step.

Each institute is independent and self-governing, but certain grades of staff have been established common to all, and it is expected that there will be promotion, not only within institutes, but from one institute to another. At each institute there is a Director who receives a personal salary. Below the Directors are Principal Assistants £600 to £800, Senior Assistants £400 to £600, Assistants £300 to £360, and temporary Junior Assistants with salaries varying according to duties and cost of living. A bonus, amounting to £150

on salaries under £400 and 15 per cent. on salaries over that sum, is paid at present, but may be reduced shortly. The positions of Principal Assistants and Senior Assistants are practically permanent and similar to those of Professor or Reader in a University so long as Parliament is willing to provide the funds. The lower and junior positions are not, however, guaranteed. A contributory superannuation scheme is in operation at most of the institutes. Although it is very unlikely that Parliament would cease to vote money for agricultural research, the most important national work in any country, it must yet be remembered that a system of annual grants-in-aid implies that the work done must justify the support given. Government control and interference are reduced to a minimum, the sole control and direction being vested in the university or college with which the institute is connected.

In addition to the Research Institutes there are also Advisory Centres organised in various parts of England and Wales for the purpose of providing specialist advice on various agricultural problems, including insect pests, the soil, animal diseases, fertilisers, &c. These specialists are also attached to the universities and have the same grades, salaries and general conditions as the Institute staffs, but are in closer touch with the Ministry of Agriculture to whom they have to submit periodical reports.

The Research scholarships are necessarily an important and fundamental part of the scheme. For this year, 1921, the maximum number of scholarships provided by the Ministry is five. The candidates must have taken an honours degree in natural science or must produce other evidence of exceptional qualifications for an advanced course in some branch of agricultural research. The applications are considered by a committee consisting of leading men in agricultural science and certain public officials. The scholarships are of the value of £200 per annum, and the scholars are required to take a course at one or more approved institutions for at least two years. Employment is not necessarily guaranteed at the end of the course, but the staffs of the research institutes would naturally be recruited from such a source, and there should be an increasing number of openings for such well-trained men in our agricultural industries. If British agriculture is to maintain its position in world economics, and according to recent correspondence in *The Times* there is plenty of room for improvement, it will have to avail itself more abundantly of the most up-to-date scientific knowledge. However, from the immediate practical point of view of a young man's career the increasing application of scientific research in agriculture generally—apart from that organised by the Ministry of Agriculture—remains at present, perhaps, merely a nebulous possibility; and it would probably be rash to count on any great demand for agricultural research students at present. The Ministry of Agriculture, at all events, is doing what it can in this direction, and ought to be strongly backed up by the great agricultural interests, especially the agricultural societies, as already hinted in the previous article. The more men we can get back to the land and to more natural surroundings the better; too many are shut up in our industrial cities. Agricultural research, properly and adequately appreciated and supported, would furnish a highly congenial career to many of our young men, and take them away from too much city life and the artificial conditions of industrialism generally; and since it should also prove a paramount factor in placing our agriculture on a thoroughly efficient and paying basis it should also powerfully aid the "back to the land" movement by enabling a larger number to make a living out of agriculture.

So far as the Ministry of Agriculture is concerned the whole scheme is yet in its infancy, and it is too early to speak of more than the promise of success. As a writer in the *Journal of the Ministry of Agriculture* for September well describes it: "To the country it promises a succession of able investigators making agricultural research their life-work; to the worker it promises a career, free, as far as reasonably possible, from the distracting cares of an ill-paid profession; to the young graduate it promises a ladder, not to riches, but to the highest rewards of science—the discovery of truth, the advancement of the public good, and the esteem and appreciation, never unduly bestowed, of his fellow-workers." The real aims and rewards of scientific research in general have seldom been better or more concisely described.

## New Regulations for Lead Works

ON October 1 the new regulations, dated August 23, 1921, for the manufacture of certain compounds of lead (carbonate, sulphate, nitrate or acetate of lead) come into operation. They are divided into Part I., applicable to the occupier, and Part II., applicable to every person employed.

According to the official definitions "lead compounds" means any carbonate, sulphate, nitrate or acetate of lead, or any lead material used in the manufacture of such compounds and containing 5 per cent. or more of lead, but excluding metallic lead or ores which contain lead only in the form of sulphide.

"Lead process" means (i.) manipulation, movement or other treatment of lead compounds involving exposure thereto, and (ii.) cleaning, repairing or demolition of any part of any building or plant which has contained lead compounds, or reconstruction of any such building or plant with material which has formed part thereof.

"Damp" means sufficiently moist to allay dust.

### Part I.—Duties of Occupiers

1.—(a) Where white lead is made by the "stack" process every stack shall be provided with a standpipe and movable hose, and an adequate supply of water distributed by a rose. (b) Every white bed shall, on the removal of the covering boards, be effectually damped by the means mentioned above.

2. Where white lead is made by the "chamber" process, the chamber shall be kept damp while the process is in operation, and the corrosions shall be effectually damped before the chamber is emptied.

3.—(a) Corrosions shall not be carried except in trays of impervious material. (b) No person shall be allowed to carry on his head or shoulder a tray of corrosions which has been allowed to rest directly upon the corrosions, or upon any surface where there are any dry lead compounds. (c) All corrosions before being put into the rollers or wash-becks, shall be effectually damped, either by dipping the tray containing them in a trough of water or by some other approved method.

4. The floor round rollers and open vats and of any place where dry lead compounds are packed or manipulated, or where cooping of old casks which have previously contained lead compounds is carried on, shall be of smooth cement or other smooth impervious material, and shall be kept constantly damp.

5.—(a) Every stove which is entered for the purpose of emptying shall have a window, or windows, with a total area of not less than 8 sq. ft., made to open, and so placed as to admit of effectual through ventilation. (b) In no stove shall bowls be placed on a rack which is more than 10 ft. from the floor. (c) Each bowl shall rest upon the rack and not upon another bowl. (d) No stove shall be entered for the purpose of drawing until the temperature at a height of 5 ft. from the floor has fallen either to 70°F., or to a point not more than 10°F. above the temperature of the air outside. (e) In drawing any stove or part of a stove there shall not be more than one stage or standing place above the level of the floor. Provided that, if approved, any other means of securing effectual through ventilation of a stove may be adopted, notwithstanding paragraph (a) of this regulation; and if approved, any other method of setting and drawing the stoves, which effectually prevents the inhalation of lead compounds, may be followed, notwithstanding paragraphs (b) and (c) of this regulation.

6. No person shall be employed on more than two days in any week in drawing any internally heated stove which is entered for the purpose of emptying.

7. No dry lead compounds shall be deposited anywhere except in an enclosure or receptacle that is provided either with a cover or with efficient means for preventing the escape of dust from such lead compounds into any workroom.

8. The treatment or packing of dry lead compounds shall be done only under conditions which either (1) prevent the escape of dust from such compounds, or (2) secure the effectual removal of such dust at or as near as practicable to its point of origin.

9. Every lead melting pot shall be provided with a proper enclosure fitted with hinged or sliding doors on any openings

necessary for manipulative purposes; and every such enclosure and every furnace used in connexion with a lead process shall be provided with an efficient exhaust draught for effectually preventing the escape from such enclosure or furnace of any dust or fume containing lead into any workroom.

10. No skimmings, dross or similar material containing lead shall be removed from the exhaust draught by Regulation 9 unless in a suitable covered receptacle.

11.—(a) Every person employed in a lead process shall be examined once a week (or at such other intervals as may be approved) by the surgeon, who shall have power to order suspension from employment in any place or process. (b) No person after such suspension shall be employed in a lead process without the written sanction of the surgeon. (c) A Health Register in an approved form shall be kept, and shall contain a list of all persons employed in lead processes.

12. The occupier shall provide and maintain sufficient and suitable overalls and head-coverings and clean respirators, and shall cause them to be worn as directed in Regulation 25. At the end of every day's work they shall be collected and kept in proper custody in a suitable place set apart for the purpose. They shall be thoroughly washed or renewed every week; and those which have been used in the stoves shall be washed or renewed daily.

13. The occupier shall provide and maintain for the use of all persons employed, and remaining on the premises during meal intervals, a suitable and adequate mess-room, which shall be furnished with (a) sufficient tables and chairs or benches with back rests, and (b) adequate means for warming food and boiling water. The mess-room shall be sufficiently warmed for use during meal intervals.

14. The occupier shall provide and maintain for the use of all persons employed suitable accommodation for clothing put off during working hours, with adequate arrangements for drying the clothing if wet. The cloak-room shall be separate from the mess-room.

15. There shall be provided and maintained in a cleanly state and in good repair for the use of all persons employed in a lead process:—(a) a lavatory, under cover, with a sufficient supply of clean towels, renewed daily, and of soap and nail brushes, and with either:—(i) a trough with a smooth impervious surface, fitted with a waste-pipe without plug, and of such length as to allow at least two feet for every five such persons employed at any one time, and having a constant supply of warm water from taps or jets above the trough at intervals of not more than two feet: or (ii) at least one lavatory basin for every five such persons employed at any one time, fitted with a waste-pipe and plug, and having a constant supply of hot and cold water or warm water laid on; and (b) sufficient and suitable bath accommodation (douche or other) with hot water laid on, unless the water supply provided under paragraph (a) is so arranged that a warm douche for the face, neck and arms can be taken. There shall, in addition, be means of washing in close proximity to the workers of each department, if required by notice in writing from the inspector in charge of the district. There shall be facilities, to the satisfaction of the inspector in charge of the district, for the workers to wash out their mouths.

16. Before each meal, and before the end of the day's work, at least 10 minutes in addition to the regular meal times, shall be allowed to each worker for washing. A notice to this effect shall be affixed in each department.

17. The mess-room, cloak-rooms, baths and sanitary conveniences shall be placed under the charge of a responsible person, and shall be kept clean.

18. The floor of each workroom in which a lead process is carried on shall be cleaned daily, after being thoroughly damped.

### Part II.—Duties of Persons Employed

19. No person shall strip a white bed or empty a chamber unless such bed or chamber is effectually damped as required by Regulations 1 and 2.

20. No person shall carry corrosions, or put them into the rollers or wash-becks, otherwise than as permitted by Regulation 3.

21. No person shall set or draw a stove otherwise than as permitted by Regulations 5 and 6.



22. No person shall deposit or pack dry lead compounds otherwise than as permitted by Regulations 7 and 8.

23. Every person employed in a lead process shall present himself at the appointed times for examination by the surgeon, as provided in Regulation 11.

24. No person, after suspension by the surgeon, shall work in a lead process without his written sanction.

25. (a) Every person engaged in white beds, emptying chambers, rollers, wash-becks or grinding, setting or drawing stoves, packing, paint mixing, handling dry lead compounds, or in any work involving exposure to dust of any lead compounds, shall, while so occupied, wear an overall suit and head-covering; (b) every person engaged in emptying white beds, emptying chambers, dry grinding, packing of dry lead compounds, handling dry lead compounds, entering a chamber used for the condensation or recovery of lead compounds, shall, while so occupied, wear a respirator.

26. Every person engaged in any place or process named in Regulation 25 shall, before partaking of meals or leaving the premises, deposit his overalls and head-covering and respirator in the place appointed by the occupier for the purpose.

27. Each person employed in a lead process shall before partaking of food or leaving the premises, wash his face, neck and arms in the lavatory provided for the purpose under Regulation 15, and where bath accommodation is provided shall take a bath at the factory at least once a week.

28. No person employed in a lead process shall smoke or use tobacco in any form, or prepare or partake of food or drink, elsewhere than in the mess-room.

29. No person shall in any way interfere, without the knowledge and concurrence of the occupier or manager, with the means and appliances provided for the removal of dust.

#### Properties of Nickel-Aluminium Copper Alloys

In a paper presented at the Annual Autumn Meeting of the Institute of Metals, held in Birmingham on September 21, Professor A. A. Read, D. Met., showed that in some of the copper rich nickel-aluminium-copper alloys the alpha solution would retain much more nickel and aluminium at 900° C. than at ordinary temperatures. Alloys typical of the region comprised between the limits of composition of the alpha solution at 900 deg. and at ordinary temperatures had been examined. These alloys, while relatively soft on quenching from 900 deg., were hardened by slow cooling from that temperature or by reheating to lower temperatures. This change was the result of the appearance of a new constituent (probably a nickel-aluminium-copper solid solution), the separation of which was accompanied by changes in the density and electrical conductivity of the alloy in addition to its effect on tensile, hardness, notched bar and other tests.

The separation of this special constituent took place somewhat slowly, so that chill-cast alloys and hot-rolled rods of small section consisted almost wholly of the alpha constituent. The cold-rolled rod, obtained by hot-rolling followed by a few passes in the cold, thus consisted almost wholly of the alpha constituent. On annealing the cold rolled alloys, softening proceeded very slowly up to 500 deg., at which temperature precipitation of the nickel-aluminium rich constituent began to take place at an appreciable rate, with the result that with some compositions a progressive increase of hardness was obtained by holding the alloy at 500° C. If the separation was sufficient this might more than counterbalance the previous softening, giving an alloy of high elastic limit and tensile strength and good elongation (e.g., a maximum load of over 50 tons per square inch with an elongation of 20 per cent.).

The rate of cooling from a temperature above that at which the alpha solution began to deposit the special constituent had a great influence on the mechanical properties of the heat-treated alloys. The hardest product was, however, obtained by reheating the quenched alloy for some time at 600° to 700° C. (say, two hours at 600°, or half-hour at 700°). The alloys so treated generally gave better properties than were obtained by any uniform rate of slow cooling (e.g., yield point over 20 tons per sq. in., maximum load over 40 tons per sq. in., elongation about 15 to 25 per cent.). The heat-treated alloys showed considerable endurance under alternating stresses above their true fatigue limit, the determination of which involved a number of prolonged tests.

## Soap Trade Workers' Wages

### Negotiations Break Down

THE Soap and Candle Trades' Joint Industrial Council, representing both employers and employed, met in conference at the Ministry of Labour, Whitehall, on September 15, to consider proposals put forward by the employers for a reduction in wages. The workers' side withdrew after the refusal of the employers to accept arbitration, and announced their intention to consult the rank and file throughout the country. The following official statement was afterwards issued on behalf of the trade unions concerned:—

The national conference of representatives of workshop delegates of all the trade unions concerned in the soap and candle manufacture had under consideration an application from the employers for a further extensive cut in wages. These proposals are: (a) A reduction of 4s. per week to males of 18 years of age and upwards, to take effect as to 2s. from the first pay week in October, and 2s. from the first pay week in December; (b) a reduction of 2s. per week to females of 18 years of age and upwards, to take effect as to 1s. from the first pay week in October, and 1s. from the first pay week in December; (c) that all firms now paying more than the standard rate for Class A towns, reduce their wages to the standard rate. This involves an additional reduction of 1s. 6d. per week in the case of Messrs. J. Crosfield & Sons, Warrington, and Messrs. W. Gossage & Sons, Widnes; 3s. per week in the case of Messrs. Prices, London; 7s. per week in the case of Messrs. Lever Bros., Port Sunlight, and Messrs. Prices, Bromborough Pool.

The delegate conference of the trade unions concerned unanimously agreed upon and submitted to the employers the following resolution: "That this delegate conference having carefully considered at great length the employers' application, instructs the workpeople of the Soap and Candle Trades' Joint Industrial Council to inform the employers that their proposals cannot be accepted."

On receipt of this the employers made the following announcement:—

The employers now desire to give definite notice to the workpeople's side that it is their intention to reduce the wages as outlined in clauses (a) and (b) of their application. In connexion with clause (c) the employers say that this is a matter for the individual firms involved, but not one of the employers shall consider themselves pledged to pay more in October than the (a) town rate, which will then be 63s. and 61s. in December.

The delegate conference of the workpeople's side decided to adjourn until to-morrow (Sunday), and in the meantime a series of open-air dinner-hour meetings have been held under the auspices of the National Union of Distributive and Allied Workers.

### Oil Trade Developments

A PRAGUE report states that the Standard Oil Co. is negotiating with the Czecho-Slovakian Government with a view to obtaining a monopoly of the oil trade in Czecho-Slovakia. It is proposed to form a new company, and to give to the Government 30 per cent. of the capital free; 20 per cent. of the capital will be offered to the public, and the remaining 50 per cent. taken over by the Standard Oil Group. If the concession is granted, the Standard Oil offer to expend not less than 100 million kronen on boring operations during the next five years, and to take up a very substantial amount of Government loan.

A Copenhagen report states that a new company has just been registered there under the style of the United Oil Factories. The share capital is eight million kronen, the greater part being held by the Anglo-Persian Oil Co. Hitherto the Danish oil trade has been entirely in the hands of the Danish Petroleum Co., a concern which is under the control of the Standard Oil Co.

It is reported that the Solvay Process Co.'s plant at Delray, near Detroit, Mich., U.S.A., has resumed operations at one-half capacity. It had been closed since July. About 1,500 men are now employed. Caustic soda and sodium carbonate are the PRINCIPAL PRODUCTS.



## Neutral Sulphate of Ammonia

### The Wilton Process

THE following account briefly describes the process of Mr. Norman Wilton, of the Chemical Engineering & Wilton's Patent Furnace Co., Ltd., for making sulphate of ammonia neutral:—

Wilton's patent, 1918, provides for the spraying of crude sulphate of ammonia with a cold alkaline solution of ammonia in water to which mother liquor is added. In this way mother liquor is disposed of, whereas, if a solution of ammonia in water alone is used, it dissolves much of the sulphate which it washes, and produces mother liquor often in excess of that which can be used up in the working of the sulphate plant. During the last few years a number of installations have been made, and some useful experience has been gained.

The ammonia solution is made either from a generator where sulphate of ammonia and lime are mixed, or automatically from the ammonia still by taking the vapours from the column at a point where the bulk of the  $H_2S$  has already been driven off. These vapours are concentrated and condensed in the same way as concentrated liquor has been made on a much larger scale in connexion with nitrogen manufacture. For the neutralising process only a very small reflux condenser is necessary. The condensed strong ammonia solution is collected in a tank; this reflux condenser starts and stops with the sulphate plant and works continuously.

The spraying solution is mixed in a tank, which should hold a sufficient quantity to avoid any testing at night; a simple method is employed during the day to assure that the spraying solution in the tank is of the correct strength. From this tank the spraying solution automatically fills another tank. After each charge of sulphate has been whizzed the contents of the latter are allowed to run into the basket by a fixed pipe, the quantity used for each charge being fixed by once adjusting the height of the outlet of the tank.

From the details given it will be seen that the extra labour attached to the working of the neutralising apparatus is so slight that it would not increase the staff working the sulphate plant. It may be mentioned that where no ammonia still exists—i.e., in direct recovery plants—the ammonia solution required is made in a generator from sulphate of ammonia in lime. In this case there is, of course, the labour in charging the generator to take into consideration, but advantage has been taken in many works of the fact that the ammonia solution is pure, and may be sold for household purposes as well as for neutralising the sulphate.

The apparatus is erected by the Chemical Engineering Co. as an ordinary manufacturing proposition with no charges or royalties.

### Synthetic Acetic Acid

THE manufacture of acetic acid from acetylene, first accomplished by Berthelot, was yet in its infancy in 1914, but the effect of the war was to bring it within the field of industrial work. A historical review of the situation and an account of the various difficulties encountered in the employment of scientific methods are given by M. Deschiens in *Chimie et Industrie*, of March, April and May. In conclusion, after mentioning the maximum normal productions of some synthetic acetic acid works, comparatively with those of acetic acid and lime acetate from pyroligneous systems, utilised in France and the United States, M. Deschiens remarks that the cost price of synthetic acid being now less, competition may be expected. However, some new applications are likely to absorb a production which will continue to increase, such as those in the cellulose acetate industry; synthetic indigo, and manufacture of various pharmaceutical products. In his report on carbonising wood, M. Deschiens remarks that synthetic acetic acid, almost unlimited in production, will find its utilisation subordinate to cost price.

According to a message from Karlsbad, the Standard Oil Company and a Czecho-American syndicate represented by the former United States Minister at Bukarest are negotiating with the Czecho-Slovakian Government for a MONOPOLY OF THE NAPHTHA PETROLEUM TRADE and exploitation.

## New British Chemical Standards

### Analytically Standardised Samples

ANOTHER new plain carbon steel is now ready for issue—viz., "R"—which fills the vacancy in the series for a carbon standard between "I" (carbon 0.521 per cent.) and "Si" (carbon 0.921 per cent.). It is also intended to serve as a high manganese standard and a sulphur standard in high carbon steel.

The analyses have been undertaken as usual by a number of experienced chemists representing the following interests: British Government Dept., U.S. Bureau of Standards, referee analysts (independent), railway analysts (representing users issuing specifications), works analysts (representing makers and users).

The standard figures are as follows:—  
CARBON STEEL "R."

|                                     | Per cent. |
|-------------------------------------|-----------|
| Carbon (combustion) ... ..          | 0.786     |
| Carbon (colorimetric) ... ..        | 0.790     |
| Silicon ... ..                      | 0.22 *    |
| Sulphur, total by oxidation ... ..  | 0.053     |
| Sulphur, evolved as sulphide ... .. | 0.050     |
| Phosphorus ... ..                   | 0.058*    |
| Manganese ... ..                    | 0.914     |
| Arsenic ... ..                      | 0.03 *    |
| Copper ... ..                       | 0.02 *    |

Ni, Cr, W, Mo, none detected by qualitative tests.

\* Approximate.

The standards may be obtained in 500, 100, or 50 gramme bottles either direct from Organising Headquarters, 3, Wilson Street, Middlesbrough; or through any of the leading laboratory furnishers, at a price just sufficient to cover the cost. A certificate giving the names of the analysts co-operating, the types of methods used, and a detailed list of the results will be supplied with each bottle.

### Hull Chemical and Engineering Society

THE syllabus for the session 1921-1922 has been issued by the Hull Chemical and Engineering Society, which now has a membership of approximately two hundred members connected with the chemical and engineering professions. The following is a list of the officers for the coming session: PRESIDENT, A. R. Tankard, F.I.C.; VICE-PRESIDENTS, R. Nelson, A.M.I.C.E., A. R. Warnes, A.I.Mech.E.; HON. TREASURER, T. G. Leggott, A.M.I.M.E.; HON. SECRETARIES, W. Geary, F.C.S., S. E. Neal, F.C.S.; COMMITTEE, Chemists—H. Thompson, F.C.S., H. Scruton, B.Sc., F.I.C., Howard Thompson, H. R. Wood, F.C.S., Miss O. M. Sanderson, F.C.S.; Engineers—R. A. Bellwood, M.I.M.E., C. Lindley, A. W. Purchas, A.M.I.C.E. and N. Foster.

The meetings will be held at the Wilberforce Café, Waterworks Street, Hull, on Tuesdays, at 7.30 p.m. The session opens on October 4 with a Whist Drive and Concert, the first meeting being on October 18, when Mr. F. Grover will lecture on "Wrapping Machinery." On November 1, Mr. J. Price Jones will read a paper on "Some Applications of Physical Chemistry to Industry," the next meeting on November 15 being devoted to an illustrated lecture on "Oil Recovery," by Mr. R. A. Bellwood. The last paper in 1921 will be read on December 6 by Dr. W. Thevenaz, the subject being "Vat Colours." An informal discussion is arranged for December 20. The programme for 1922 comprises: January 3, "The Manufacture and Application of the Chief Commercial Dyestuffs," by F. G. Stephan; January 17, "Modern Electricity Supply," by H. Bell; February 7, "The Theories of Catalytic Agency," by W. C. Batty; February 21, "The Prevention of Works Accidents," by F. W. Hunt; March 7, "Steam," by A. W. Purchas; March 21, "Electrical Machinery Breakdowns," by C. Lindley; April 4, Presidential Address—"The Influence of Science on Human Life"; and April 18, Annual Meeting.

Large deposits of sulphate of magnesium and sulphate of aluminium are available in Chile, according to the American consul at Arica. An analysis of the sulphate of magnesium by a laboratory in Iquique showed that it contained 54.5 per cent. pure sulphate of magnesium and 45.5 per cent. water, while the sulphate of aluminium was found to contain 51.5 per cent. pure sulphate of aluminium and 48.5 per cent. water.

### Affairs of Youngmans, Ltd.

#### Meeting of Creditors

A MEETING of the creditors of Youngmans, Ltd., chemists, 6, The Traverse, Bury St. Edmunds, was held recently, at the offices of the Association of Manufacturing Chemists, Kimberley House, Holborn Viaduct, E.C. The chair was occupied by Mr. Parkin S. Booth, the accountant to the Association, who had been appointed to act as the liquidator in the voluntary liquidation of the company.

According to the statement of affairs presented the liabilities amounted to £854 6s. 5d., all of which were due to the trade. The assets were estimated to realise £861 1s. 2d., less £154 17s. 11d. for preferential claims, leaving net assets of £706 3s. 3d. or a deficiency of £148 3s. 2d. The assets were as follows:—Proceeds of sale of business, £800; cash in hand, £11 1s. 2d.; and book debts, £62 7s. 2d., expected to produce £50.

With regard to the liabilities, Mr. Booth pointed out that the preferential claims included amounts totalling £137 19s. 10d. in respect of two executions levied prior to his appointment. With regard to the assets the business had been sold for £800. For some months past several creditors had been pressing the company, and in certain instances executions had been levied, but the position, he was told, was not known to the directors, and he understood that money was borrowed privately to pay out certain executions. Recently it was arranged that an exhaustive audit should be made of the company's books.

The creditors present unanimously confirmed the appointment of Mr. Booth as liquidator, and expressed appreciation of the manner in which the estate had been handled.

The following are creditors:—Ashton & Parsons, Ltd., £10; Allen & Hanbury's, Ltd., £14; Angiol, Ltd., £11; Bankes, Ashton & Co., £26; W. B. Cartwright, Ltd., £22; Crosskill & Sons, £26; Cupal, Ltd., £34; Thos. Christy & Co., £16; W. Cooper & Nephews, Ltd., £52; De Witt & Co., Ltd., £10; Erasmic Co., Ltd., £10; Evans Sons, Lescher & Webb, Ltd., £32; Edme, Ltd., £15; W. Edwards & Sons, Ltd., £64; Edge & Sons, Ltd., £26; Thos. Guest & Co., Ltd., £25; Harker Stagg & Morgan, Ltd., £63; G. B. Kent & Sons, Ltd., £36; Liebig Standard Wine Co., £11; Francis Newbery & Sons, Ltd., £12; Pilchers, Ltd., £33; A. & F. Pears, Ltd., £11; J. Richardson & Co. (Leicester), Ltd., £36; Snell & Co., £39; Stephen Willson, £20.

#### Receiver for Electrolytic Copper Co.

NOTICE has been filed at Somerset House of the appointment of H. S. Mackay, of 4-6, Copthall Avenue, E.C., by order of court dated September 8, 1921, as receiver of all the rights of the Electrolytic Copper Co., Ltd., under an agreement dated November 24, 1915, with the Mackay Copper Process Co., and in the patents and applications for patents mentioned therein. The Electrolytic Copper Co., Ltd., is incorporated in Guernsey.

#### Uses of the Scleroscope

IN the course of a paper presented at the Birmingham meeting of the Institute of Metals on September 22, Mr. R. S. Tritton said that some experience in the use of the scleroscope for testing the hardness of small pieces of metal in the laboratory had led him to doubt whether the real hardness values of small samples were obtained, although the usual precautions were taken to support the specimens in an apparently rigid manner. The experiments were undertaken with a view to finding out whether errors existed when using ordinary methods of support and, if so, to find some method of support that would eliminate them. Errors were detected, and to reduce them the author selected two materials, respectively pitch and glucose, for the purpose of supporting the specimens in the scleroscope. The use of pitch requires a special clamp, a new type of which was described. On the other hand, without the use of a clamp, a solution of glucose considerably stiffer than treacle was found to give excellent results, the specimens under test being simply attached by means of the glucose to a hard steel base. In this way there could be readily tested the hardness of specimens having not merely flat but curved surfaces—such as balls or rollers—provided that a recessed support be made to fit the specimens.

### World's Oil Supplies

#### Progress Dependent on Chemists and Engineers

READING a paper last week before the Oil Conference at Olympia, held in connexion with the Shipping, Engineering and Machinery Exhibition, Mr. S. H. North said that if prospective users for power purposes would strike a balance between the cost of oil and the cost of coal, taking every item into consideration, they would find that oil had the advantage. Oil was incomparably the better fuel. Progress in the use of oil for power production was entirely dependent on our engineers and chemists. We were discovering a method of squeezing a greater efficiency out of oil than was secured 20 years ago. By its nature oil lent itself readily to wastage. Vast quantities were wasted in production, in transportation, storage, local distribution and in use. Fortunately, we could not burn oil in the same unscientific, insane manner in which coal was burned. We must keep a sharp eye on every leakage which occurred from the time the oil came from the well until the moment it was converted into power. By doing this we should prolong the oil supplies of the world, of which, however, he did not believe we had yet touched the hundredth part.

#### Catalogues Received

JOSEPH BAKER, SONS & PERKINS, LTD., of Kingsway House, W.C.2, send us a new brochure which describes and illustrates the firm's kneading, mixing and sifting machinery. This machinery is applicable to a number of uses and is supplied in a variety of sizes and types, from the hand-driven kneaders and mixers for experimental work to large direct electric-drive machines. One of the features of the brochure is their patent "Universal" powder blender, a simple apparatus for blending dry powders. It is furnished with two sets of stirrers and "throw-over" blades working in opposite directions. Emptying is effected automatically through suitable emptying valves operated by a lever.

Addition No. 1 to the catalogue of the Chemical Engineering & Wilton's Patent Furnace Co., Ltd., of Hendon, N.W.4, consists of a four-page leaflet setting out the advantages of neutral sulphate of ammonia and of Wilton's process. An illustration shows a complete installation fitted where a centrifugal is in use, a different apparatus being necessary where there is no centrifugal machine in use.

"Pyruma," the Fire Cement with 101 Uses, is the title of an attractively printed booklet illustrated in colour (in the Heath Robinson manner) and issued by J. H. Sankey & Son, Ltd., of Essex Wharf, Canning Town, E.16. "Pyruma" is made in two grades—coarse, for bulk work and general furnace construction, and putty for smaller work and lower temperatures. It is, the booklet states, very useful for the repair of small laboratory furnaces, the making of air-tight joints, and for making temporary stands for test-tubes and other apparatus. Several more of the 101 uses are outlined in the booklet.

We have received from Automatic & Electric Furnaces, Ltd., of 281-283, Gray's Inn Road, W.C.1, an advance copy of their new catalogue describing the Wild-Barfield electric furnaces. This catalogue contains interesting information on the pyroscopic detector in theory and practice and descriptions of vertical and horizontal hardening furnaces, excess-temperature cut-outs, carburising furnaces, oil and salt tempering baths, air tempering muffles, maturing ovens, and the magnetic scleroscope. We have also received a copy of Bulletin No. 29, which has been prepared with the idea of explaining in simple language to employees why the best results in hardened steel are obtained by hardening at the non-magnetic point.

Ronald Trist & Co., Ltd., of Dinneford House, 12, Clipstone Street, W.1, send us a copy of their Booklet S.1, 1921, illustrating the "Guardian," a patent safety device for use with oil-fired burners, thermo-feed regulators and S.E.A. rings and cups.

An attractively produced catalogue describing the "Lancaster" specialities is issued by Lancaster & Tonge, Ltd., of Pendleton, Manchester. It deals with pistons, steam taps, steam dryers and metallic packages, giving particulars of their construction and working.

Mr. S. HORWOOD TUCKER has been appointed to the lectureship in organic chemistry in the University of Glasgow.

## British Cyanides

### Interest in Potash Company

MR. C. F. ROWSELL presided on Wednesday at Cannon Street Hotel, E.C., at the ordinary general meeting of British Cyanides, Ltd., and, in moving the adoption of the report and accounts, which showed a net loss on the year of £59,597, said the position disclosed by the balance-sheet reflected pretty clearly the conditions of trade through which they had been passing, and the losses they had sustained were common to nearly all businesses. In the early part of the past financial year they decided it was desirable that they should acquire outside interests in the potash company, as they found it extremely difficult to work with the two companies where there were conflicting interests. It was hoped that when the business was restored once more to a sound footing there would be no reason to regret the acquisition of the shares of that company. A good deal of time had been devoted to the development of the barium process, and there was little doubt that they would be successful with their experiments and have an extremely valuable asset for the company. During the coal strike they had had to close down their works, a step which was inevitable.

### Institution of Mining Engineers

PROFESSOR SIR JOHN CADMAN, of the Coal Mining and Petroleum Faculty of the University of Birmingham, is the new president of the Institution of Mining Engineers, being elected to this position at the annual meeting at Stoke-on-Trent on Wednesday last week. In his presidential address Sir John touched on a number of problems connected with the mining industries. There was, he said, a certain justice in the complaint that science had achieved of recent years little for coal in the way of developing, cheapening and popularising its by-products, and its proper use as compared with what they had done for oil. If that reproach were based on fact, as he thought it might be, it was clearly one of the functions of such an Institution as that of the Mining Engineers to do what they could to remove it. It should appeal to them both technically and nationally. Speaking later at the annual dinner of the Society, in reply to the toast of the Institution of Mining Engineers, proposed by the Earl of Harrowby, Sir John Cadman characterised as absurd the suggestion that petroleum was going to replace coal. Petroleum had come in at a very important stage in the development of this world—when we wished to move more rapidly and desired to see new services and new sources of power. The products derived from oil—petrol, paraffin and lubricating oils—would be used in a particular channel, a source of power peculiar in itself. The time would come when it would become necessary to supplement this mobile source of power. It was possible, and researches in the coal industry were bound to follow that particular line. Who knew whether it might not be possible to liquefy coal and convert it into some mobile form of energy?

### Electrolytic Etching of Metals

ELECTROLYTIC methods of etching various metals with a view to the preparation of useful micro-sections were described by Mr. F. Adcock in a paper read at the Autumn Meeting of the Institute of Metals on September 22. The author found that a solution of citric acid as an electrolyte in the etching bath yielded good results with cupro-nickel (80:20), silver, nickel-silver and some other metals, and it was noticed that silver and nickel-silver specimens which had been comparatively roughly treated during the polishing process often gave clearer etchings than the specimens which had been polished with great care. Certain specimens of silver showed on etching a cell structure or network which was smaller than, and in some cases independent of, the existing crystal grains.

Another electrolyte made by dissolving molybdic acid in excess of ammonia solution gave somewhat similar results and revealed a subsidiary cell formation or net-work in the "Beta" regions of a beta plus gamma brass containing 6 per cent. of aluminium. By making use of such reagents as hydrofluoric acid, chromic acid and bromine water both the cores (or dendrites) and the crystal grain boundaries of cast cupro-nickel were disclosed simultaneously.

## Government Contracts

THE following were among the Government Contracts let during August:—

ADMIRALTY: *Soft Soap Substitute*: Palmer & Co., Ltd., London.

WAR OFFICE.—*Glue, Best Town Made*: Sheppy Glue & Chemical Works, Ltd., Queenborough. *Linseed Oil, Boiled*: Younghusband, Barnes & Co., Rotherhithe. *Litharge Paint, Lead, Red*: Rowe Brothers & Co., Ltd., Liverpool. *Oil, Petroleum, Fuel*: Anglo-American Oil Co., Ltd., London; The British Petroleum Co., Ltd., London. *Paint, Dry, Lead Colour*: Brimsdown Lead Co., Ltd., Brimsdown. *Soda Crystals*: United Alkali Co., Ltd., Liverpool. *Soft Soap (Potash)*: Peter Lunt & Co., Liverpool. *White Lead*: Rowe Brothers & Co., Ltd., Liverpool. *Zinc Oxide L. R.*: Fenner & Alder & Co., Ltd., Millwall and Poplar; Foster, Mason & Harvey, Ltd., Bermondsey. *Zinc Oxide (Lead Free)*: Taylor Brothers & Cox, Ltd. (Agents for Landore Zinc Works), near Swansea.

CROWN AGENTS FOR THE COLONIES.—*Blasting Powder*: W. H. Wakefield & Co., Kendal. *Fuze*: Bickford & Co., Ltd., Cornwall. *Paint*: The Torbay Paint Co., London, E.C.

HIGH COMMISSIONER FOR INDIA.—*Compressor*: Lacy-Hulbert & Co., Ltd., London, S.W. *Condenser, &c.*: Worthington-Simpson, Ltd., London, W.C. *Sterilising Plant*: Manlove, Alliott & Co., Ltd., London, S.W.

### Chemical Research in Paper Making

AT a conference of the Technical Section of the Papermakers' Association of Great Britain, held on Wednesday in Edinburgh, under the presidency of Mr. A. Baker, of the Empire Paper Mills, Principal Laurie, Edinburgh, urged the importance of scientific training for those who were to be engaged in the industry in responsible technical positions. From the point of view of research, he thought the chemist was more important than the engineer. Dr. J. L. A. Macdonald said that Germany, the United States, Canada, and Japan were working tooth and nail to develop the scientific side of paper-making, and, as it was going to be a race for the markets of the world, Britain would have to give early attention to fundamental chemical research.

### Fireproof Bricks from Diatomaceous Earth

BURNT bricks suitable for the inside lining of cavity walls and hollow blocks for partitions, as well as the construction of floors, and having marked insulating properties, are being manufactured by the Moler Fireproof Brick & Partition Co., Ltd., of Vickers House, Broadway, Westminster, S.W. 1. The material from which they are manufactured is known as Moler, a form of diatomaceous earth of marine origin, and consisting of diatom silex naturally admixed with clay. Bricks made from this material will float in water as readily as wood, and are about half the weight of ordinary bricks. They are claimed to be highly fire and sound proof, and incidentally have a wide application for the protection of steelwork from fire or corrosion. For insulating coverings it is said to be superior to the usual kieselguhr compounds, on account of the presence of clay, which gives the necessary plasticity without the addition of other binding materials.

Part of a hollow Moler partition block was, it is stated, submitted to a flame from an oil-fire blast furnace for a period of three days, in which a temperature of 1,200°C. was obtained. The wall thickness of the fragment measured  $\frac{3}{4}$  in., and while the external surface had fluxed the inner face showed no signs of injury.

### Patents Court Case

Application has been made for the following patents to be indorsed "Licences of Right" under Section 24 of the Patents and Designs Acts, 1907 and 1919:—130,320 (Aktieselskabet Stordö Kisgruber) relating to a discharging device for the separated heaviest ore or rock in an ore-concentrating machine; 130,841 (A. Welter) relating to a process for producing soda containing water of crystallisation or mixtures thereof with other substances.



## From Week to Week

Five wagons loaded with LUBRICATING OIL were destroyed by fire on Tuesday at Broxburn Oilworks, West Lothian.

NEW BY-PRODUCTS WORKS are to be started at the Maritime Colliery, Pontypridd, by the Great Western Collieries, Ltd.

THE SLAG PHOSPHATE CO., LTD., of Lloyds Bank Chambers, Newport (Mon.), have opened London offices at 38-39, Parliament Street, S.W. 1.

During 1920, Egypt imported 120,247 tons of FERTILISERS, valued at £2,900,000, as compared with 57,718 tons valued at £1,400,000 in 1919.

It is reported that a Japanese inventor claims to have discovered a process for making CEMENT FROM COAL REFUSE at a saving of 25 per cent.

For the seventeenth successive year Mr. JOHN HUSSELBEE, of Brierley Hill, Staffs, has been re-appointed general secretary of the National Society of Glass Makers.

As the result of a ballot the LEAD MINERS at Wanlockhead lead mines, Lanarkshire, after a strike of over eight months, have decided to accept the employers' terms.

The death occurred on August 29 at Vineland, U.S.A., of Mr. JOSEPH CONDE, a director of the Vineland Scientific Glass Co. Mr. Conde, who was 44 years old, was a son of the late Mr. Joseph Conde, of Birmingham.

Mr. CRANE COOPER, who has been Chief Inspector of Weights and Measures and Explosives at Hull for over 40 years, and who is now 80 years of age, is being retained in an advisory capacity after having tendered his resignation.

Dr. STEPHEN MIALI has been selected by the Government as one of the British representatives on the advisory committee of experts on industrial hygiene set up by the governing body of the International Labour Office in accordance with a resolution adopted by the Washington Conference.

On September 13 Dr. M. O. Forster, President of the Chemistry Section of the BRITISH ASSOCIATION, stated that the General Committee proposed holding the next meeting in Hull in 1922, and in Liverpool in 1923, and in Canada in 1924. The members of the section cordially accepted these invitations.

The sum of \$500,000 has been made available for two years for the continuation of research work on NITROGEN FIXATION in the United States of America. The Fixed Nitrogen Research Laboratory at Washington, with a staff of 120, has been transferred from the War Department to the Department of Agriculture.

The death occurred on September 17 at Penycraig of Mr. Rees Lloyd, THE OLDEST CHEMIST in the Rhondda Valley. Mr. Lloyd, who was 71 years of age, was in the fourth generation of chemists, his father, grandfather and great-grandfather having carried on the same business. He had done a good deal of research work in his time.

THE ANGLO-PERSIAN OIL CO., LTD., is reported to have entered into relations with a Danish syndicate for the marketing of their products in Denmark. They are also understood to have made a similar arrangement with a Norwegian syndicate for the marketing of oil in Norway. The Anglo-Persian Co. will supply the oil, and the two syndicates in question will market it.

A spark from a locomotive caused AN OUTBREAK OF FIRE, on Saturday evening, which spread to the premises of W. J. Bush & Co., manufacturing chemists, in Ash Grove, Hackney. They occupy the ground floor, and Peall, Roy & Co., Ltd., gum merchants, the first floor. The building and the contents suffered slightly, and the offices and store had the side front scorched.

THE BROKEN HILL PROPRIETARY CO., LTD., have received the following cable from the head office in Melbourne: "Board have decided to resume production of zinc concentrates. Gave directions to re-start sulphuric-acid works, regrounding plant, slimes flotation plant, and zinc flotation plant at Broken Hill. Slimes flotation plant now operating three shifts, and other surface operations will gradually be resumed. No underground operations."

The Ministry of Agriculture and Fisheries have published a report prepared by Mr. G. B. Wilson, with a contribution by Dr. J. G. Platt, on the LEAD, ZINC, COPPER, AND NICKEL

ORES OF SCOTLAND. It is the seventeenth memoir issued by the Geological Survey under the general title of "Special Reports on the Mineral Resources of Great Britain." The volume is issued from the Ordnance Survey Office, Southampton.

A new method for the VULCANISATION OF RUBBER is reported to have been discovered by Professor Bruni, of the Pirelli Research Laboratories, Milan. He claims that if certain accelerators such as thiocarbonylides which are formed by the action of an organic amine and carbon bisulphide are produced relatively to the rubber in the nascent state, particularly in the presence of zinc oxide, curing takes place at ordinary temperatures.

Messrs. Edmiston, auctioneers, Glasgow, on Tuesday commenced the four days' sale of the plant and machinery at the GRENA MUNITIONS FACTORY. The Disposals Board have also determined to put the factory buildings and the garden townships, covering 4,000 acres, in the market. The first day's sale of plant attracted buyers from the large centres of England, Scotland, and Ireland. Prices were generally low, but purchasers have to bear the cost of dismantling.

According to the Forest Products Laboratory, Wisconsin, an increase of 50 per cent. in the YIELD OF WOOD ALCOHOL may be obtained by means of an inexpensive treatment consisting of the addition of a small percentage of sodium carbonate to the wood before distillation. Experiments at the laboratory show that this increased yield may be obtained without diminishing the yield of acetic acid. Contact of the carbonate with all of the wood is necessary to secure the full benefit of the treatment.

A report from Madrid states that the trial boring put down by the Spanish Government in association with the German Potash Syndicate, at Cardona, having reached a depth of about 1,200 metres without striking either POTASH OR ROCK-SALT DEPOSITS, is to be abandoned. It is also stated that the American group which acquired an interest in the Solvay concessions in Spain, and has spent several million pesetas in sinking a shaft for potash, has terminated the contract and abandoned further operations.

Seaham Urban Council recently wrote Mr. Gilby, managing director of the SEAHAM BOTTLE WORKS, which have not resumed since the coal dispute, asking him if the works could be restarted. Mr. Gilby, writing from the offices of the United Glass Bottle Manufacturers, Ltd., London, said he could not say when the works would restart, and if bad trade continued it would be a question of shutting other works. He attributed the stoppage to the depression caused by the coal strike and the falling off in the export trade.

No mention was made on the programme of the British Association of the Fuel Economy Committee's report, and none was presented to Section B during the Edinburgh meeting. The Committee, however, has prepared A SHORT REPORT in which it is pointed out that no work has been done during the year owing to the industrial position and the unfortunate illness of Professor Bone, the Chairman. It asks, however, for re-appointment to complete the work outlined in the third report presented last year.

AN EXPLOSION OCCURRED in Woolwich Arsenal just before midday on September 15. A number of men were at work in the danger area, and were handling explosives when the accident occurred, but exactly what their task was is unknown. As the result of the explosion, Nicholas Hickey, of 34, Halstead Road, Walworth, the foreman, was killed, J. Cooper, of Verney Road, Bermondsey, died in hospital during the evening from the injuries he received, and J. Fitzgerald, of Earlsall Road, Eltham, and a man named Bee, of Eglington Road, Plumstead, were severely injured.

The possibility of UTILISING SEWAGE GAS as a driving power was discussed by Mr. J. D. Watson in the Engineering Section of the British Association. Experiments in Birmingham, he said, had shown the practicability of economically driving a suction engine with gas derived from sewage sludge. This was used in the plant for the purification of sewage to drive a 3-4 H.P. gas engine. There was a complete absence of smell, and without wishing to dogmatise, he suggested that it behoved local authorities in these days of enforced economy to investigate this source of power hitherto regarded as less than valueless.

## References to Current Literature

## British

- WATER.** American standards for quality of water. J. J. Hinman, jun. *J.S.C.I.*, September 15, 1921, pp. 325-327R.
- WASTE LIQUORS.** Some practical applications of the theory of biological purification of waste liquors. G. T. P. Tatham. *J.S.C.I.*, September 15, 1921, pp. 201-202T.
- COKING.** The path of travel of the gases in the coke oven. G. E. Foxwell. *J.S.C.I.*, September 15, 1921, pp. 193-201T.
- VERMIN DESTRUCTION.** The destruction of rats by chemical means. C. L. Claremont. *J.S.C.I.*, September 15, 1921, pp. 327-328R.
- GENERAL.** The laboratory of the living organism. Part I. M. O. Forster. *Chem. News*, September 16, 1921, pp. 147-152.
- DYEING.** Modern leather dyeing. A. Harvey. *Dyer*, September 1, 1921, pp. 88-89.  
Some notes on the dyeing of skins. C. Process. *Dyer*: Part V., September 1, 1921, pp. 86-87; Part VI., September 15, 1921, pp. 108-110.  
The dyeing of leather. Part I. A. Harvey. *Dyer*, September 15, 1921, pp. 106-107.
- PHTHALIC ACID.** Phthalic anhydride and phthalic acid. J. Scott. *Dyer*, September 1, 1921, pp. 92-93.
- CAUSTIC SODA.** Electrolytic caustic soda. Part VI. R. Sansone. *Dyer*, September 15, 1921, pp. 112-113.
- DYESTUFFS.** Pigment dyestuffs derived from tannic acid and some aromatic amines. A. E. Everest and A. J. Hall. *J. Soc. Dyers and Col.*, September, 1921, pp. 227-229.  
Fastness of gambines. H. Robinson. *J. Soc. Dyers and Col.*, September, 1921, pp. 229-231.
- RUBBER.** Rubber Substitutes and the rôle they play in vulcanisation. D. H. Priestley and H. Skellon. *Rubber Age*, September, 1921, pp. 351-352.  
The presence of manganese in raw rubber and the origin of tackiness. G. Bruni and C. Pelizzola. *Rubber Age*, September, 1921, pp. 364-366.

## United States

- ATOMIC WEIGHTS.** A revision of the atomic weight of cadmium. Part V. The electrolytic determination of cadmium in cadmium sulphate. G. P. Baxter and C. H. Wilson. *J. Amer. Chem. Soc.*, June, 1921, pp. 1230-1241.  
A revision of the atomic weight of zinc. Part II. The electrolytic determination of zinc in zinc chloride. G. P. Baxter and J. H. Hodges. *J. Amer. Chem. Soc.*, June, 1921, pp. 1242-1251.
- MOLECULAR COMPOUNDS.** Unsaturation and molecular compound formation. Part II. O. Maass and J. Russell. *J. Amer. Chem. Soc.*, June, 1921, pp. 1227-1230.
- PLATINUM.** The preparation of pure platinum. E. Wichers. *J. Amer. Chem. Soc.*, June, 1921, pp. 1268-1273.
- ESTERS.** Esters of aminobenzoic acids. H. C. Brill. *J. Amer. Chem. Soc.*, June, 1921, pp. 1320-1323.  
The ortho-diethylamino-cyclohexanol ester of para-aminobenzoic acid. A. E. Osterberg and E. C. Kendall. *J. Amer. Chem. Soc.*, June, 1921, pp. 1370-1371.
- SPECTRO-CHEMISTRY.** The obliteration of the characteristic spectra of metals by certain gases. G. E. Gibson and W. A. Noyes, jun. *J. Amer. Chem. Soc.*, June, 1921, pp. 1255-1261.
- CATALYSIS.** A periodic reaction in homogeneous solution and its relation to catalysis. W. C. Bray. *J. Amer. Chem. Soc.*, June, 1921, pp. 1262-1267.  
The adsorption of gases by metallic catalysts. H. S. Taylor and R. M. Burns. *J. Amer. Chem. Soc.*, June, 1921, pp. 1273-1287.
- THERMAL REACTIONS.** The radiation theory of thermal reactions. W. C. M. Lewis and A. McKeown. *J. Amer. Chem. Soc.*, June, 1921, pp. 1288-1306.
- GELATINE.** Osmosis and swelling of gelatine. C. R. Smith. *J. Amer. Chem. Soc.*, June, 1921, pp. 1350-1366.
- ASPHALT.** A chemical investigation of the asphalt in the tar sands of Northern Alberta. V. H. Kriebel and W. F. Seyer. *J. Amer. Chem. Soc.*, June, 1921, pp. 1337-1349.

**ANALYSIS.** The quantitative separation of the lead salts of the saturated from the less unsaturated fatty acids. A. Seidenberg. *J. Amer. Chem. Soc.*, June, 1921, pp. 1323-1336.

## French

- ALBUMINS.** The albumin of white of egg. Professor Sørensen. *Bull. Soc. Chim.*, August 20, 1921, pp. 593-624.
- ANTHRACENE OILS.** Influence of chemical constitution upon the thermal properties of binary mixtures. Part IV. Constituents of anthracene oils. P. Pascal. *Bull. Soc. Chim.*, August 20, 1921, pp. 644-656.
- SUGARS.** The influence of ammonium molybdate upon the rotary power of some sugars. G. Tanret. *Bull. Soc. Chim.*, August 20, 1921, pp. 670-678.  
The influence of ammonium molybdate upon the rotary power of mannite. G. Tanret. *Bull. Soc. Chim.*, August 20, 1921, pp. 678-683.
- PHOTO-CHEMISTRY.** Phototropism. P. Gallagher. *Bull. Soc. Chim.*, August 20, 1921, pp. 683-696.
- TELLURIUM COMPOUNDS.** Tellurium tetraiodide. A. Damiens. *Bull. Soc. Chim.*, August 20, 1921, pp. 696-701.
- NITRO-COMPOUNDS; AMIDO-COMPOUNDS.** Nitro- and amido-derivatives of methylethylbenzene. A. Mailhe. *Bull. Soc. Chim.*, August 20, 1921, pp. 713-717.
- REACTION.** The action of sulphonating mixtures on metals. P. Pascal. *Bull. Soc. Chim.*, August 20, 1921, pp. 701-709.
- SODIUM COMPOUNDS.** A new method for the preparation of sodium derivatives of true acetylene hydrocarbons. M. Picon. *Bull. Soc. Chim.*, August 20, 1921, pp. 709-713.
- RACEMIC COMPOUNDS.** Active racemic compounds. M. Delépine. *Bull. Soc. Chim.*, August 20, 1921, pp. 656-669.
- ANALYSIS.** Acetyl index of fatty materials. E. André. *Bull. Soc. Chim.*, August 20, 1921, pp. 745-752.  
Estimation of bromine in salt waters. P. Lebeau and M. Picon. *Bull. Soc. Chim.*, August 20, 1921, pp. 739-743.  
Quantitative separation of tin and antimony in presence of phosphoric acid. M. Mouret and J. Barlot. *Bull. Soc. Chim.*, August 20, 1921, pp. 743-745.
- WATERPROOFING.** The waterproofing of fabrics. Part III. M. de Keghel. *Rev. Chim. Ind.*, August, 1921, pp. 229-237.
- BLEACHING.** The industry of bleaching powders, peroxides and per-salts. Part II. M. de Keghel. *Rev. Chim. Ind.*, August, 1921, pp. 238-246.

## German

- SYSTEMS.** Transformations in certain heterogeneous systems. E. Ramann and H. Sallinger. *Z. phys. Chem.*, June 17, 1921, pp. 103-150.
- CONSTITUTION.** General methods for ascertaining the true molecular constitution of pure substances and their mixtures. M. B. Wagner. *Z. phys. Chem.*, June 17, 1921, pp. 81-93.
- ALLOYS.** A method for determining the percentage composition of metals in alloys whose qualitative composition is known. K. Schmidt. *Chem.-Zeit.*, August 27, 1921, pp. 825-826.
- CELLULOSE.** Wood cellulose. E. Heuser and E. Boedeker. *Z. angew. Chem.*, September 9, 1921, pp. 461-464.  
Cellulose. Part IV. The depolymerisation of ethyl cellulose. K. Hess, W. Wittelsbach and E. Messmer. *Z. angew. Chem.*, September 2, 1921, pp. 449-454.
- AMMONIUM SULPHATE.** The conversion of gypsum by means of aqueous ammonia. B. Neumann. *Z. angew. Chem.*, September 6, 1921, pp. 457-459.
- ANALYSIS.** Estimation of cadmium. Part II. L. W. Winckler. *Z. angew. Chem.*, September 13, 1921, pp. 466-467.  
The determination of the iodine number of fats by means of a solution of iodine monochloride in carbon tetrachloride. B. M. Margosches and R. Baru. *Z. angew. Chem.*, September 2, 1921, pp. 454-456.  
Estimation of alkali hydroxide and carbonate in the presence of cyanide and ferrocyanide. F. Muhlert. *Z. angew. Chem.*, August 30, 1921, pp. 447-448.
- LIQUID AIR.** Liquid air. K. Schreiber. *Chem. Apparatur*. Part III., July 10, 1921, pp. 109-111; Part IV., July 25, 1921, pp. 120-122.

## Patent Literature

### Abstracts of Complete Specifications

167,789. LUBRICATING OIL, AND METHODS OF MANUFACTURING THE SAME. J. Harger, Grange Hollies, Gateacre, Liverpool. Application date, February 18, 1920.

The process is for the manufacture of lubricating oils by the treatment of vegetable and animal oils with air to oxidise them. The oil is mixed with a catalytic agent consisting of a compound of manganese, lead or mercury and heated to a temperature between 50°C. and 300°C., but not above the cracking point of the oil, and blowing air or oxygen through the mixture. The catalyst enables the oil to absorb the oxygen at a lower temperature and at an accelerated rate. The mixture may alternatively be sprayed into a vessel through which the gas is passed, or the oil may pass downwards through a vessel containing the catalytic material through which the gas is passed in the opposite direction. The amount of air is regulated so that a sample of the oil shows a content of fatty acids from 0.2 to 1.0 per cent. If the ultimate product is made up by mixing oxidised oil with untreated oil, the former may be oxidised to a correspondingly greater extent. The temperature of the operation should be the lowest at which the reaction takes place at a reasonable rate. Any volatile oxidised products may be retained in the oil or may be allowed to escape. To retain these products streams of hot oil and gas are caused to flow in the same direction in contact with one another, and are cooled while in contact to the temperature at which the volatile products are condensed. The resulting oils may be mixed with other oils or with alkali, soap, or graphite.

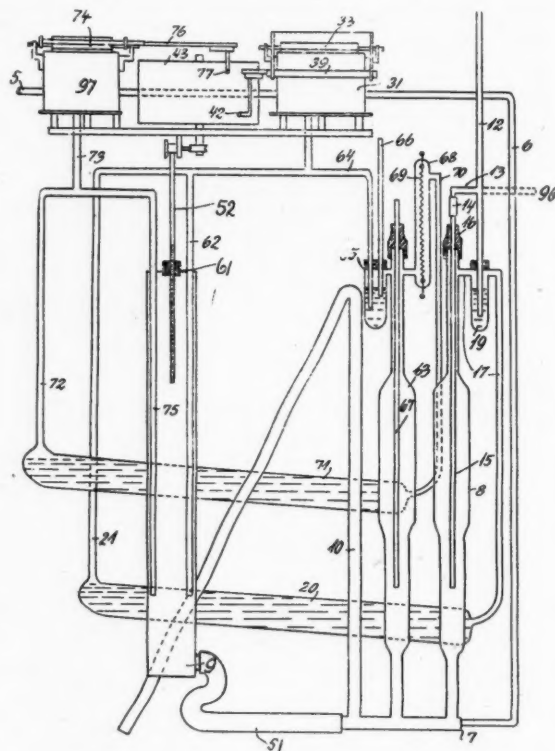
167,822. DISTILLING CARBONACEOUS MATERIAL, APPARATUS FOR. W. P. Perry, 19, Lytton Road, Leytonstone, London, E. 11. Application date, May 10, 1920.

The apparatus is of the type in which carbonaceous material is distilled with hot gas in a retort and in which the solid residue is treated in an adjacent gas producer at a lower level. The material is fed into the top of a vertical retort having openings on both sides leading into gas chambers on both sides. The gas collecting chamber on one side is connected by a number of outlet pipes at different levels to the common main. The bottom of the retort is closed by a plunger which reciprocates horizontally and feeds the hot solid residue into a downwardly inclined conduit which delivers it into the top of the producer. The gas from the producer passes upwards through the same inclined conduit into the gas chamber on that side of the retort. The hot gas then passes from this chamber through the perforated wall into the retort to distil the carbonaceous material. Two reciprocating plungers may be used to discharge the hot residue from the retort and so provide a uniform feed to the producer. In this apparatus little or no heat is lost during the transfer of the material.

167,824. AUTOMATIC ANALYSIS OF GASES, RECORDING ANALYSING APPARATUS FOR. S. A. S. Krogh, 11, Ny Vestergade, Copenhagen, Denmark, and P. H. Pedersen, 67, Fuglebakkevej, Fredriksberg, near Copenhagen. Application date, May 10, 1920.

The apparatus is for the automatic analysis of gas mixtures such as those containing carbon dioxide and carbon monoxide. The apparatus is operated by water pressure in a manner which regulates exactly the time interval between consecutive analyses. The gas is aspirated through a tube 12 and liquid trap 19 into a pipette 8 by the periodic outflow of water through the syphon 10 at each cycle. Water is supplied through a pipe 5 to vessels 97 and 31 containing measuring bells 74 and 33, and thence through a pipe 6 to the bottom of the pipette 8. The water in rising forces the gas back through the pipe 15 until the lower end of this pipe is sealed when a pre-determined quantity of gas is trapped. A further rise of the water forces the gas through the pipe 17 to the vessel 20 filled with absorbent liquid. The residual gas passes through the pipe 21 into the measuring bell 33, where its volume is recorded by a stylus 42 on a rotating drum 43. When the water level reaches the top of the syphon 10 the water is discharged and the residual gas is drawn from the bell 33 through the trap 65 into a similar pipette 63, while the first

charge is drawn into the pipette 8. Air is also drawn in through the tube 66, mixed with the carbon monoxide, and the mixture is driven by the rise of the water over the electric heating element 69, which enables the carbon monoxide to be converted into carbon dioxide. The gas is forced into the vessel 71 in which the carbon dioxide is absorbed and the residue passes to the measuring device 97, where its volume is recorded by the stylus 77. The drum 43 is rotated by means of the vessel 9, which is suspended by a spring and connected



167,824

at its lower end by a flexible tube 51 to the bottom of the syphon. The rise and fall of the vessel 9, due to the combined effect of its varying weight and the tension of the spring, operates through a ratchet mechanism to rotate the drum 43. Other gas mixtures may be analysed in a similar manner, e.g., the percentage of oxygen in an air mixture, in which case sufficient hydrogen is admitted through the pipe 66 to absorb the oxygen by combustion.

167,863. ROASTING FURNACES. S. Sokal, London. (Allis Chalmers Manufacturing Co., Milwaukee, Wis., U.S.A., and Santiago, Chile.) Application date, May 19, 1920.

The furnace is more particularly for the roasting of sulphide ores to convert the sulphides into oxides. These furnaces usually have a number of hearths through which the ore passes gradually from the highest to the lowest. If special conditions are required, e.g., incomplete oxidation, preferential oxidation of one mineral, or chloridising following roasting, it is sometimes difficult to maintain the exact conditions necessary and an unsuitable product may be delivered. This may be avoided by dividing the furnace into independent sections which are separated by sliding doors, each being provided with an independent set of rabbles. The hearths are arranged in steps. The material in each section is moved into the succeeding section by an independent operation, so that no mixing of the ore in different sections takes place, and a complete control in each section may be maintained.

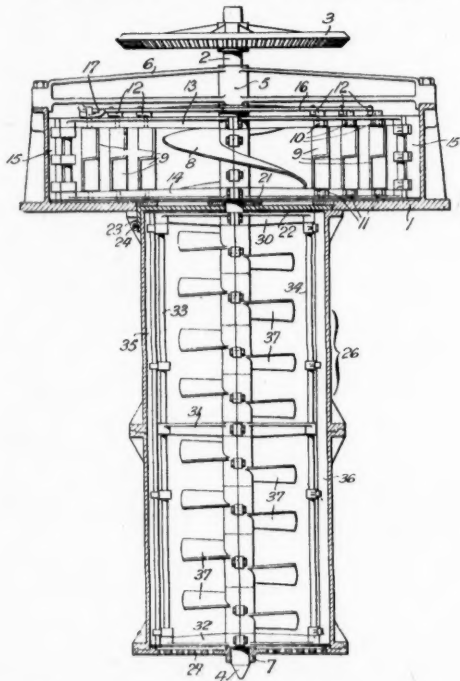


167,941. ALKYL AMIDES OF AROMATIC SULPHONIC ACIDS, MANUFACTURE OF. British Cellulose & Chemical Manufacturing Co., 8, Waterloo Place, London, S.W. 1, W. Bader, and D. A. Nightingale, of British Cellulose & Manufacturing Co., Ltd., Spondon, Derby. Application date, June 2, 1920.

If the chlorides of aromatic sulphonic acids are treated with aqueous ammonia the corresponding amides are formed, but if an alkyl substituted ammonia reacts with an aromatic sulphonyl-chloride the corresponding alkyl sulphonyl-amide is not produced. These sulphonyl-amides may, however, be produced by the reaction of alkyl amine salts, sulphonyl-chlorides and neutralising agents such as alkali carbonates, calcium carbonate or other alkaline earth carbonates, in the presence of a very small quantity of water, preferably not more than 5 per cent. In an example a mixture of xylene sulphonyl-chloride, mono-methyl-amine hydrochloride, and sodium carbonate is heated to 80°C. to 100°C. with not more than 5 per cent. of moisture. The mono-methyl xylene sulphonyl-amide may be extracted by benzene and rectified *in vacuo* after distillation of the benzene. The process may also be applied to the manufacture of dialkyl amides of sulphonic acids in a similar manner by using the dialkyl amine salts.

168,010. WET MIXERS. R. V. Mattison, jun., Upper Dublin Township, Pa., U.S.A. Application date, June 18, 1920.

A vertical shaft 2 passes centrally through the mixing tank 1 and is supported by a thrust bearing at 4. This shaft carries parallel arms 13 and 14 having pivoted scrapers 15 which are in contact with the side walls of the tank. Mixing blades 9 are also carried which have one half of their length at right angles to the other half. These blades may be set in two positions at right angles by means of a horizontal link 16 which engages with a crank arm 12 carried by each of the blades. The shaft 2 also carries a large auger or screw 8



168,010

in the centre of the tank. The tank 1 is separated from the receiving tank 26 by means of two circular discs 21 and 22 having radial openings which may be made to register or not, to control the passage of the material. When these slots are closed the rotation of the screw moves the material downwards, and then outwards to the blades 9 which also convey it outwards. The material then flows inwards by the action of the upper portion of the blades 9 back to the screw 8, thus moving in a cycle. The shaft 2 carries arms 30, 31, 32, which support scrapers 35, 36, and mixing blades 37 are also attached to

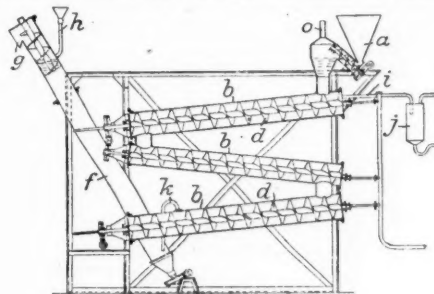
the shaft. The mixed material is thus pressed downwards slowly and uniformly so as to remove all entrained air. The material is finally delivered through the perforated plate 27. The passage of the mixture from the tank 1 to the tank 26 is assisted, after the upper part of the charge has been allowed to pass, by turning the blades 9 through an angle of 90 deg., so that the mixture is directed towards the centre of the tank instead of outwards.

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 138,650 (A. Godal), relating to manufacture of sulphonyl-aromatic agents for the hydrolysis of fatty acid glycerides, see Vol. II., p. 448.

#### International Specifications not yet Accepted

166,525. LIXIVIATING APPARATUS. R. Adler, Haus Damfschiff, Carlsbad, Czecho-Slovakia. International Convention date, July 13, 1920.

The apparatus is for lixiviating solid materials, and at the same time treating them with gases. The material is admitted from a hopper *a* to a series of slightly inclined tubular shafts *b* which are connected together at opposite ends alternately. The material is conveyed through the shafts by helical con-



166,525

veyors *d* and then carried upwards through a shaft *f* to an outlet *g*. A solvent passes through the apparatus in the opposite direction, being introduced through a pipe *h* and discharged through a pipe *i*. Gas is also passed through the shafts with the liquid from an inlet *k* to an outlet *o*. The solvent finally passes to a vessel *j*, where gas may be separated from it.

166,530. DYES. Durand et Huguenin Soc. Anon., Basle, Switzerland. International Convention date, July 15, 1920.

A mixture of methylene dianilido-*o*-oxyaryl-carboxylic acid with an *o*-oxyaryl-carboxylic acid is oxidised to produce triaryl-methane dyes. The anilido group may contain substituents in the nucleus such as NO<sub>2</sub>, halogen, or CH<sub>3</sub>, and substituted *o*-oxyaryl-carboxylic acids may be used. The starting substance, methylene dianilido-*o*-oxyaryl-carboxylic acid, may be prepared by condensing an anilido-*o*-oxyaryl-carboxylic acid with formaldehyde, or by condensing the *o*-oxyaryl-carboxylic acid with formaldehyde and anilinating the product. In one example anilido salicylic acid and para-formaldehyde are condensed in sulphuric acid and salicylic acid is added and oxidised by sodium nitrite. A red dyestuff is obtained, and may be sulphonated. In another example the starting substance is obtained by treating methylene disalicylic acid with aniline and phosphorus trichloride. In another example anilido-*o*-cresotinic acid and formaldehyde are condensed together, mixed with *o*-cresotinic acid and oxidised to obtain a bluish-red dyestuff. In another example *p*-nitranilido salicylic acid and paraformaldehyde are condensed, mixed with salicylic acid, and oxidised to obtain a yellowish-red dyestuff.

166,538. IRON AND STEEL MANUFACTURE. J. T. Pratt, 7, East Sixty-first Street, Manhattan, New York; J. D. Sears, 425, Franklin Street, Bloomfield, N.J., U.S.A.; and D. D. Jackson, 930, President Street, Brooklyn, New York, trading as Chemical Treatment Co. (Assignees of W. L. Estabrooke, 12, Prospect Drive, Yonkers, New York). International Convention date, July 13, 1920.

Iron ore, iron, or steel, is desulphurised by adding a halogen

compound such as calcium hypochlorite to it in a blast furnace, converter, or ladle. The halogen compound should contain a constituent which volatilises or enters the slag, or improves the process; thus the calcium in calcium hypochlorite assists in the dephosphorisation of the iron, or phosgene may be used so that the carbon monoxide liberated assists the reduction process. Carbon tetrachloride may also be used.

166,541. HYDROGEN, PURIFYING. Deutsche Gluhfaden-fabrik R. Kurtz and Dr. Ing. P. Schwarzkopf Ges., 18, Lindowerstrasse, Berlin. International Convention date, July 13, 1920.

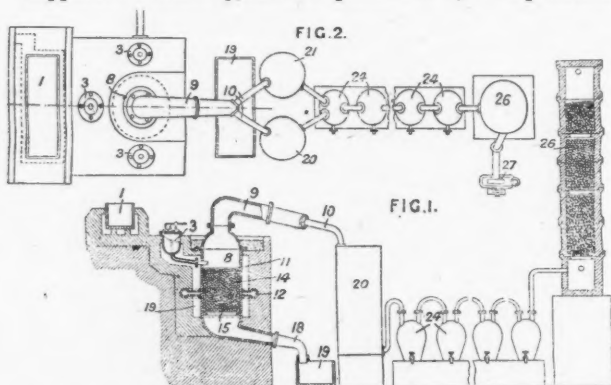
To purify hydrogen from carbon monoxide, the gas is passed over finely-divided molybdenum, tungsten, or other metal in the same periodic group, which is heated to incandescence. The heating may be effected in an electric furnace with foil of platinum, nickel, or chrome nickel set at a temperature of 800°C. to 850°C.

166,544. COKE OVENS. H. Lentz, 46, Hauptstrasse, Mauer, near Vienna. International Convention date, July 15, 1920.

The lower side of the oven is made in the form of steps with inclined surfaces over which the fuel passes in succession. The fuel is conveyed downwards by means of rotating flaps which also serve to separate the adjacent steps, and to turn the fuel over. Heating is effected by hot gases from a furnace below, which pass upwards below the fuel. The coke is finally delivered to a crusher.

166,557. NITRIC ACID AND CAUSTIC SODA. R. V. Jubany, 35, Calle de Girona, Barcelona, Spain. International Convention date, July 20, 1920.

Sodium nitrate is dried in a vessel 1, fused in pots 3, and delivered to a reaction vessel 8 containing a catalyst which is supported between perforated plates 11, 15. Superheated



166,557

steam is delivered to the reaction vessel through a pipe 12, and nitric acid and caustic soda are produced. Nitric acid vapour is drawn off by pipes 9, 10, and cooled and absorbed in vessels 20, 21, 24. The gases are finally passed through an absorption tower 26. Molten caustic soda is drawn off to a tank 19 through an outlet 18.

#### LATEST NOTIFICATIONS.

- 168,835. Process for the extraction of glycerine from the waste liquors of alcoholic fermentation. Barbet et Fils et Cie, E. September 29, 1916.
- 168,859. Process and apparatus for carbonising bituminous substances such as coal, bituminous shale, and the like at low temperature. Meguin Akt.-Ges. Butzbach and Muller, W. September 4, 1920.
- 168,871. Process and burner for the combustion of metaldehyde for cooking. September 4, 1920.
- 168,887. Crucibles. Bellis Heat Treating Co. August 30, 1920.
- 168,888. Portable apparatus for generating poisonous gas. Meter, J. W. van. August 31, 1920.
- 168,902. Method of producing ammonia from nitrogen and hydrogen. Norsk Hydro Elektrisk Kvaestofaktieselskab. September 7, 1920.

#### Specifications Accepted, with Date of Application

- 144,278. Pressure filters of the leaf type. United Filters Corporation. May 18, 1916.
- 144,306. Sulphur from sulphur dioxide, Method of making. American Smelting & Refining Co. September 9, 1918.

- 146,251. Hydrocarbon oils, Apparatus for cracking and distilling. R. H. Brownlee. July 11, 1917.
- 147,741. Regenerative coke ovens. Dr. C. Otto & Co., Ges. January 10, 1918.
- 148,122. Alkali metals and alloys thereof, Manufacture of. I. Hackspill and C. Staehling. November 5, 1913.
- 148,820. Illuminating gas, Process and plant for the production of—by distillation of coal. A. Birkholz. October 22, 1915.
- 148,892. Hydrocarbons into fatty acids, Process and apparatus for converting. Deutsche Erdol Akt.-Ges. July 12, 1919.
- 151,631. Basic open hearth furnaces. S. Naismith. April 17, 1916.
- 156,752. Cellulose ethers, Process for the production of plastic bodies of. G. Leysieffer. January 10, 1920.
- 159,465. Colloids, Method of drying. G. P. Lunt. February 25, 1920.
- 168,415. Evaporators. H. Fothergill. June 2, 1920.
- 168,434. Metallic oxide ores, Process and apparatus for the reduction of. J. W. Moffat and W. F. Sutherland. June 8, 1920.
- 168,447. Intermediate products, Manufacture and production of— and new colouring matters therefrom and their application in dyeing and printing. J. Y. Johnson (Badische Anilin & Soda Fabrik). June 16, 1920.
- 168,482. Sulphur from gases, Process for removing. South Metropolitan Gas Co., E. V. Evans, H. Hollings and H. Stanier. July 9, 1920.
- 168,504. Hydrogen sulphide from gases, Process for removing. South Metropolitan Gas Co., E. V. Evans, and H. Stanier. July 29, 1920.
- 168,535. Mixed gases, Retorts and apparatus in connexion therewith for the production of. F. H. Robinson. October 2, 1920.
- 168,551. Grinding or crushing machines. W. E. Trent. December 1, 1920.
- 168,557. Separating by flotation and collecting a liquid of comparatively low specific gravity from a liquid of higher specific gravity, Apparatus for. D. B. Morison. March 1, 1920.

#### Applications for Patents

- Archer, M. W. (Coke & Gas Ovens, Ltd.) Method of producing white commercially-pure ammonium chloride. 24,203. September 12.
- Bretton, J. H. M. de. Waterproofing and colouring agents. 24,371. September 13.
- British Dyestuffs Corporation, Ltd. Manufacture of dye-stuffs. 24,456. September 14.
- British Northrop Loom Co., Ltd. (Northrop Loom Co.). Feeler mechanism for looms. 24,308. September 13.
- British Thomson-Houston Co., Ltd. (General Electric Co.). Manufacture of silica glass. 24,466. September 14.
- British Thomson-Houston Co., Ltd. (General Electric Co.). Chemical apparatus. 24,467. September 14.
- Carr, R. H. Machinery for manufacture of saggars, sinks, crucibles, linings for ovens and quarries. 24,289. September 13.
- Clayton, H. F. Oil-burning furnaces. 24,217. September 12.
- Duckham, Sir A. M. Retort-discharging devices. 24,634. September 16.
- Engström, A. E. Manufacture of glue. 24,438. September 14.
- Fairweather, H. G. C. (Guggenheim Bros.). Recovery of nitrate from caliche. 24,415. September 14.
- Hucks, H. L. Device for controlling discharge of liquid from calibrated receptacle. 24,381. September 13.
- Hurrell, G. C. Filter medium. 24,366. September 13.
- Imray, O. Y. (Obear-Nester Glass Co.). Machines for blowing glass. 24,242. September 12.
- Imray, O. Y. (Obear-Nester Glass Co.). Mechanism for conveying articles from glass-blowing machines. 24,243. September 12.
- Imray, O. Y. (Obear-Nester Glass Co.). Take-out and steadying mechanism for glass-blowing machines. 24,244. September 12.
- Leech, S. Composition of india-rubber compounds. 24,383. September 13.
- Lutz, H. E. Retorts for distilling carbonaceous material. 24,232. September 12.
- McInnes, T. M. Mixing-valves. 24,172. September 12.
- Minerals Separation, Ltd. Purification of bituminous or gummy substances. 24,581. September 15.
- Nance, C. W. Manufacture of tanning, etc., extracts. 23,923. September 8.
- Niece, F. G. Cracking hydrocarbons. 23,856. September 7.
- Norsk Hydro-Elektrisk Kvaestofaktieselskab. Method of producing ammonia from nitrogen and hydrogen. 23,639. September 5. (Norway, September 7, 1920.)
- Payman, J. B. Manufacture of 1:4 naphthol sulphonic acid. 24,139. September 10.
- Pearson, R. E. Production of oxides of tungsten and molybdenum. 23,964. September 8.
- Plauson, H., & Plauson's (Parent Co.), Ltd. Process for treatment of rock phosphate, &c. 24,392. September 14.

## Market Report and Current Prices

*Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

### Market Report

THURSDAY, September 22.

There has been a considerable improvement in business during the past week, and buyers are in many directions endeavouring to cover themselves at some little distance ahead in view of the operation of the Safeguarding of Industries Act.

The extraordinary scope of the schedule which has been issued under the Act has been a source of general surprise, and most people have been taken unprepared.

The application of the schedule in many directions is still very obscure, and it seems likely to be some time before the real scope of the measure is properly appreciated.

The markets are buoyant in consequence of the forthcoming duty, and amongst the articles affected the advance is likely to be progressive as the month goes on.

The export demand has been much quieter, and the new British legislation will tend to make foreign competition in overseas markets even more severe.

### General Chemicals

ACETONE has advanced in price, and stocks in the country are negligible.

ACID ACETIC is much higher in price and in active demand.

ACID CITRIC is affected by the new legislation, and the price is reacting accordingly.

ACID FORMIC is much dearer, and stocks are firmly held.

ACID OXALIC has advanced rapidly, and higher prices are anticipated.

ACID TARTARIC is liable to duty under the new Act, and an active business is reported.

BLEACHING POWDER is unchanged, and the business passing is purely nominal.

COPPER SULPHATE.—Buyers remain very shy, and in face of Continental offerings forward business is difficult.

FORMALDEHYDE is much higher in price and in steady demand.

IRON SULPHATE is unchanged.

LEAD ACETATE has been advanced by local makers expecting the protection of the tariff. The demand, however, remains purely nominal.

LEAD NITRATE continues in demand with price firmer.

LITHOPONE is unchanged in price and in poor demand.

POTASSIUM CARBONATE.—The tendency remains steadier but little business is reported.

POTASSIUM CAUSTIC is unchanged.

POTASSIUM CHLORATE.—The market is uncertain, and many sellers have withdrawn until they see whether the article is affected by the tariff.

POTASSIUM PRUSSATE is again higher in price and in much better demand.

SODIUM ACETATE has jumped in price, being liable to the new duty. Stocks are comparatively light.

SODIUM BICHROMATE is inclined to be firmer, and second-hands are not so much in evidence.

SODIUM CAUSTIC.—Prices are generally creeping up, but the demand remains small.

SODIUM NITRITE has been in rather better demand; price nominally unchanged.

SODIUM PHOSPHATE.—The improvement in demand is maintained, but the tendency is still rather slow.

SODIUM PRUSSATE is again stronger, and makers have little to offer.

SODIUM SULPHIDE.—A fair business is reported at recent prices.

### Coal Tar Products

The market generally for coal-tar products is inactive, and there is little fresh business passing.

90's BENZOL is still very difficult to obtain, and for prompt

delivery the price remains in the region of 3s. in London and 2s. 10d. in the North.

PURE BENZOL is also scarce, and is quoted at 3s. 6d. on rails.

CREOSOTE OIL has an easier tendency, and is worked at 8d. on rails in the North, and 8½d. to 9d. in the South.

CRESYLIC ACID is quiet, but a little fresh business is passing and is quoted at 2s. 3d. on rails for the Pale quality, with Dark at about 1s. 10d. to 2s.

SOLVENT NAPHTHA is rather more plentiful, although all parcels offered are bought freely at from 2s. 7d. to 2s. 8d. on rails.

HEAVY NAPHTHA is quoted at from 2s. 4d. to 2s. 6d. on rails.

NAPHTHALENE is in poor demand; the crude qualities are worth from £5 to £8 per ton, while the refined qualities are quoted at from £15 to £17 per ton.

### Coal Tar Intermediates

A fair inquiry continues to come in for these products, and a certain amount of business is passing.

ALPHA NAPHTHYLAMINE is inquired for and remains steady at last quotations.

ANILINE OIL AND SALT are in demand at about makers' figures.

ANTHRAQUINONE.—A number of inquiries have been received.

BETA NAPHTHOL is in small request, and the price remains unchanged.

DIMETHYLANILINE is asked for, and supplies are not excessive.

DIPHENYLAMINE continues in firm demand, and the price is maintained.

"H" ACID continues firm at last quotations.

PARANITRANILINE is in demand at latest figures.

RESORCIN.—A fair business has been done, and the price continues firm.

SALICYLIC ACID is inquired for, and the upward tendency has continued.

PITCH.—The market is unchanged, and there is a steady demand.

### Sulphate of Ammonia

There is a fairly good demand for export, and prices have an upward tendency.

### Current Prices

| Chemicals                            |     | per |    | £ s. d. |    | to  |    | £ s. d. |   |
|--------------------------------------|-----|-----|----|---------|----|-----|----|---------|---|
|                                      |     | lb. |    | 0       | 2  | 1   | to | 0       | 2 |
| Acetic anhydride .....               | ton | 87  | 10 | 0       | to | 90  | 0  | 0       | 0 |
| Acetone oil .....                    | ton | 90  | 0  | 0       | to | 95  | 0  | 0       | 0 |
| Acetone, pure .....                  | ton | 60  | 10 | 0       | to | 62  | 10 | 0       | 0 |
| Acid, Acetic, glacial, 99-100% ..... | ton | 42  | 0  | 0       | to | 45  | 0  | 0       | 0 |
| Acetic, 80% pure .....               | ton | 95  | 0  | 0       | to | 100 | 0  | 0       | 0 |
| Arsenic .....                        | ton | 65  | 0  | 0       | to | 68  | 0  | 0       | 0 |
| Boric, cryst .....                   | ton | 0   | 0  | 8½      | to | 0   | 0  | 7       |   |
| Carbolic, cryst. 39-40% .....        | lb. | 0   | 2  | 5       | to | 0   | 2  | 6       |   |
| Citric .....                         | ton | 65  | 0  | 0       | to | 67  | 10 | 0       |   |
| Formic, 80% .....                    | ton | 0   | 4  | 0       | to | 0   | 4  | 3       |   |
| Gallie, pure .....                   | lb. | 0   | 0  | 8½      | to | 0   | 0  | 9       |   |
| Hydrofluoric .....                   | ton | 35  | 0  | 0       | to | 37  | 10 | 0       |   |
| Lactic, 50 vol. ....                 | ton | 40  | 0  | 0       | to | 42  | 10 | 0       |   |
| Lactic, 60 vol. ....                 | ton | 38  | 0  | 0       | to | 40  | 0  | 0       |   |
| Nitric, 80 Tw. ....                  | ton | 0   | 0  | 8       | to | 0   | 0  | 8½      |   |
| Oxalic .....                         | lb. | 45  | 0  | 0       | to | 47  | 0  | 0       |   |
| Phosphoric, 1.5 .....                | ton | 0   | 7  | 6       | to | 0   | 7  | 9       |   |
| Pyrogallie, cryst .....              | lb. | 0   | 1  | 2       | to | 0   | 1  | 3       |   |
| Salicylic, Technical .....           | lb. | 0   | 1  | 6       | to | 0   | 1  | 7       |   |
| Salicylic, B.P. ....                 | lb. | 8   | 0  | 0       | to | 8   | 10 | 0       |   |
| Sulphuric, 92-93% .....              | ton | 0   | 3  | 8       | to | 0   | 3  | 9       |   |
| Tannic, commercial .....             | lb. | 0   | 1  | 4½      | to | 0   | 1  | 5½      |   |
| Tartaric .....                       | lb. |     |    |         |    |     |    |         |   |



|  | per  | £   | s. | d. | to | £   | s. | d. |
|--|------|-----|----|----|----|-----|----|----|
| Alum, lump.....                            | ton  | 18  | 0  | 0  | to | 18  | 10 | 0  |
| Alum, chrome.....                          | ton  | 37  | 10 | 0  | to | 40  | 0  | 0  |
| Alumino ferric .....                       | ton  | 9   | 0  | 0  | to | 9   | 10 | 0  |
| Aluminium, sulphate, 14-15%.....           | ton  | 12  | 0  | 0  | to | 13  | 0  | 0  |
| Aluminium, sulphate, 17-18%.....           | ton  | 15  | 0  | 0  | to | 16  | 0  | 0  |
| Ammonia, anhydrous.....                    | lb.  | 0   | 2  | 0  | to | 0   | 2  | 2  |
| Ammonia, .880.....                         | ton  | 43  | 0  | 0  | to | 45  | 0  | 0  |
| Ammonia, .920.....                         | ton  | 30  | 0  | 0  | to | 32  | 10 | 0  |
| Ammonia, carbonate.....                    | lb.  | 0   | 0  | 4  | to | —   | —  | —  |
| Ammonia, chloride.....                     | ton  | 60  | 0  | 0  | to | 65  | 0  | 0  |
| Ammonia, muriate (galvanisers) ..          | ton  | 45  | 0  | 0  | to | 47  | 10 | 0  |
| Ammonia, nitrate .....                     | ton  | 53  | 0  | 0  | to | 60  | 0  | 0  |
| Ammonia, phosphate .....                   | ton  | 82  | 10 | 0  | to | 85  | 0  | 0  |
| Ammonia, sulphocyanide .....               | lb.  | 0   | 3  | 0  | to | 0   | 3  | 0  |
| Amyl acetate .....                         | ton  | 150 | 0  | 0  | to | 160 | 0  | 0  |
| Arsenic, white, powdered .....             | ton  | 32  | 0  | 0  | to | 35  | 0  | 0  |
| Barium, carbonate, 92-94%.....             | ton  | 12  | 10 | 0  | to | 13  | 0  | 0  |
| Barium, chlorate .....                     | lb.  | 0   | 0  | 11 | to | 0   | 1  | 0  |
| Chloride .....                             | ton  | 15  | 0  | 0  | to | 16  | 0  | 0  |
| Nitrate .....                              | ton  | 42  | 10 | 0  | to | 45  | 0  | 0  |
| Barium Sulphate, blanc fixe, dry... ..     | ton  | 26  | 0  | 0  | to | 28  | 0  | 0  |
| Sulphate, blanc fixe, pulp ...             | ton  | 16  | 0  | 0  | to | 16  | 10 | 0  |
| Sulphocyanide, 95% .....                   | lb.  | 0   | 1  | 6  | to | 0   | 1  | 0  |
| Bleaching powder, 35-37% .....             | ton  | 14  | 0  | 0  | to | —   | —  | —  |
| Borax crystals .....                       | ton  | 31  | 0  | 0  | to | 32  | 0  | 0  |
| Calcium acetate, Brown.....                | ton  | 8   | 0  | 0  | to | 9   | 0  | 0  |
| „ Grey.....                                | ton  | 10  | 0  | 0  | to | 11  | 0  | 0  |
| Calcium Carbide .....                      | ton  | 22  | 0  | 0  | to | 23  | 0  | 0  |
| Chloride.....                              | ton  | 12  | 10 | 0  | to | 13  | 0  | 0  |
| Carbon bisulphide.....                     | ton  | 60  | 0  | 0  | to | 62  | 0  | 0  |
| Casein, technical .....                    | ton  | 85  | 0  | 0  | to | 90  | 0  | 0  |
| Cerium oxalate.....                        | lb.  | 0   | 3  | 6  | to | 0   | 3  | 9  |
| Chromium acetate .....                     | lb.  | 0   | 1  | 1  | to | 0   | 1  | 3  |
| Cobalt acetate .....                       | lb.  | 0   | 11 | 0  | to | 0   | 11 | 6  |
| Oxide, black .....                         | lb.  | 0   | 16 | 0  | to | —   | —  | —  |
| Copper chloride .....                      | lb.  | 0   | 1  | 3  | to | 0   | 1  | 6  |
| Sulphate .....                             | ton  | 28  | 10 | 0  | to | 29  | 10 | 0  |
| Cream Tartar, 98-100%.....                 | ton  | 125 | 0  | 0  | to | 130 | 0  | 0  |
| Epsom salts (see Magnesium sulphate)       |      |     |    |    |    |     |    |    |
| Formaldehyde 40% vol.....                  | ton  | 92  | 10 | 0  | to | 95  | 0  | 0  |
| Formosol (Rongalite) .....                 | lb.  | 0   | 3  | 9  | to | 0   | 4  | 0  |
| Glauber salts, commercial .....            | ton  | 5   | 5  | 0  | to | 5   | 10 | 0  |
| Glycerine, crude.....                      | ton  | 70  | 0  | 0  | to | 72  | 10 | 0  |
| Hydrogen peroxide, 12 vols. ....           | gal. | 0   | 2  | 8  | to | 0   | 2  | 9  |
| Iron perchloride .....                     | ton  | 45  | 0  | 0  | to | 50  | 0  | 0  |
| Iron sulphate (Copperas) .....             | ton  | 4   | 0  | 0  | to | 4   | 5  | 0  |
| Lead acetate, white .....                  | ton  | 48  | 0  | 0  | to | 50  | 0  | 0  |
| Carbonate (White Lead).....                | ton  | 43  | 0  | 0  | to | 46  | 0  | 0  |
| Nitrate.....                               | ton  | 48  | 10 | 0  | to | 50  | 10 | 0  |
| Litharge .....                             | ton  | 35  | 10 | 0  | to | 36  | 0  | 0  |
| Lithopone, 30% .....                       | ton  | 27  | 0  | 0  | to | 29  | 0  | 0  |
| Magnesium chloride.....                    | ton  | 12  | 0  | 0  | to | 13  | 0  | 0  |
| Carbonate, light.....                      | cwt. | 2   | 10 | 0  | to | 2   | 15 | 0  |
| Sulphate (Epsom salts commercial) ..       | ton  | 10  | 10 | 0  | to | 11  | 10 | 0  |
| Sulphate (Druggists') .....                | ton  | 15  | 10 | 0  | to | 17  | 10 | 0  |
| Manganese, Borate.....                     | ton  | 70  | 0  | 0  | to | 75  | 0  | 0  |
| Sulphate .....                             | ton  | 70  | 0  | 0  | to | 75  | 0  | 0  |
| Methyl acetone.....                        | ton  | 85  | 0  | 0  | to | 90  | 0  | 0  |
| Alcohol, 1% acetone .....                  | ton  | 105 | 0  | 0  | to | 110 | 0  | 0  |
| Nickel sulphate, single salt .....         | ton  | 65  | 0  | 0  | to | 66  | 0  | 0  |
| Nickel ammonium sulphate, double salt..... | ton  | 67  | 0  | 0  | to | 68  | 0  | 0  |
| Potash, Caustic .....                      | ton  | 32  | 0  | 0  | to | 32  | 10 | 0  |
| Potassium bichromate .....                 | lb.  | 0   | 0  | 9  | to | —   | —  | —  |
| Carbonate, 90% .....                       | ton  | 31  | 0  | 0  | to | 33  | 0  | 0  |
| Chloride.....                              | ton  | 36  | 0  | 0  | to | 38  | 0  | 0  |
| Chlorate.....                              | lb.  | 0   | 0  | 5  | to | 0   | 0  | 5  |
| Meta bisulphite, 50-52% .....              | ton  | 120 | 0  | 0  | to | 125 | 0  | 0  |
| Nitrate, refined .....                     | ton  | 45  | 0  | 0  | to | 47  | 0  | 0  |
| Permanganate .....                         | lb.  | 0   | 1  | 2  | to | 0   | 1  | 4  |
| Prussiate, red .....                       | lb.  | 0   | 2  | 0  | to | 0   | 2  | 1  |
| Prussiate, yellow.....                     | lb.  | 0   | 1  | 2  | to | 0   | 1  | 3  |
| Sulphate, 90% .....                        | ton  | 31  | 0  | 0  | to | 33  | 0  | 0  |
| Salammoniac, firsts .....                  | cwt. | 3   | 5  | 0  | to | —   | —  | —  |
| Seconds .....                              | cwt. | 3   | 0  | 0  | to | —   | —  | —  |
| Sodium acetate .....                       | ton  | 28  | 0  | 0  | to | 30  | 0  | 0  |
| Arsenate, 45% .....                        | ton  | 60  | 0  | 0  | to | 62  | 0  | 0  |
| Bicarbonate .....                          | ton  | 10  | 10 | 0  | to | 11  | 0  | 0  |
| Bichromate .....                           | lb.  | 0   | 0  | 6  | to | 0   | 0  | 7  |
| Bisulphite, 60-62% .....                   | ton  | 27  | 10 | 0  | to | 30  | 0  | 0  |
| Chlorate .....                             | lb.  | 0   | 0  | 4  | to | 0   | 0  | 5  |
| Caustic, 70% .....                         | ton  | 24  | 0  | 0  | to | 24  | 10 | 0  |
| Caustic, 76% .....                         | ton  | 25  | 10 | 0  | to | 26  | 0  | 0  |
| Hydrosulphite, powder, 85% ..              | lb.  | 0   | 2  | 3  | to | 0   | 2  | 6  |
| Hyposulphite, commercial.....              | ton  | 15  | 0  | 0  | to | 16  | 0  | 0  |
| Nitrite, 96-98%.....                       | ton  | 40  | 0  | 0  | to | 42  | 0  | 0  |
| Phosphate, crystal.....                    | ton  | 23  | 0  | 0  | to | 25  | 0  | 0  |
| Perborate.....                             | lb.  | 0   | 1  | 6  | to | 0   | 1  | 7  |

|                                    | per | £  | s. | d. | to | £  | s. | d. |
|------------------------------------|-----|----|----|----|----|----|----|----|
| Prussiate .....                    | lb. | 0  | 0  | 8  | to | 0  | 0  | 8  |
| Sulphide, crystals .....           | ton | 17 | 0  | 0  | to | 18 | 0  | 0  |
| Sulphide, solid, 60-62% .....      | ton | 23 | 10 | 0  | to | 24 | 10 | 0  |
| Sulphite, cryst.....               | ton | 15 | 0  | 0  | to | 16 | 0  | 0  |
| Strontium carbonate .....          | ton | 80 | 0  | 0  | to | 85 | 0  | 0  |
| Strontium Nitrate .....            | ton | 70 | 0  | 0  | to | 72 | 10 | 0  |
| Strontium Sulphate, white .....    | ton | 7  | 10 | 0  | to | 8  | 10 | 0  |
| Sulphur chloride.....              | ton | 41 | 0  | 0  | to | 42 | 0  | 0  |
| Sulphur, Flowers .....             | ton | 13 | 0  | 0  | to | 14 | 0  | 0  |
| Roll .....                         | ton | 13 | 0  | 0  | to | 14 | 0  | 0  |
| Tartar emetic .....                | lb. | 0  | 1  | 5  | to | 0  | 1  | 6  |
| Tin perchloride, 33% .....         | lb. | 0  | 1  | 2  | to | 0  | 1  | 4  |
| Tin Perchloride, solid .....       | lb. | 0  | 1  | 5  | to | 0  | 1  | 7  |
| „ protochloride (tin crystals) ... | lb. | 0  | 1  | 5  | to | 0  | 1  | 6  |
| Zinc chloride, 102 Tw. ....        | ton | 21 | 0  | 0  | to | 22 | 10 | 0  |
| Chloride, solid, 96-98%.....       | ton | 50 | 0  | 0  | to | 55 | 0  | 0  |
| Oxide, 99% .....                   | ton | 40 | 0  | 0  | to | 42 | 0  | 0  |
| Dust, 90% .....                    | ton | 47 | 10 | 0  | to | 50 | 0  | 0  |
| Sulphate .....                     | ton | 21 | 10 | 0  | to | 22 | 10 | 0  |

## Coal Tar Intermediates, &amp;c.

|                                     |      |   |    |    |    |   |    |    |
|-------------------------------------|------|---|----|----|----|---|----|----|
| Alphanaphthol, crude .....          | lb.  | 0 | 3  | 3  | to | 0 | 3  | 6  |
| Alphanaphthol, refined .....        | lb.  | 0 | 3  | 9  | to | 0 | 4  | 0  |
| Alphanaphthylamine.....             | lb.  | 0 | 2  | 6  | to | 0 | 2  | 8  |
| Aniline oil, drums extra .....      | lb.  | 0 | 1  | 5  | to | 0 | 1  | 6  |
| Aniline salts .....                 | lb.  | 0 | 1  | 6  | to | 0 | 1  | 7  |
| Anthracene, 40-50% .....            | unit | 0 | 0  | 8  | to | 0 | 0  | 9  |
| Benzaldehyde (free of chlorine).... | lb.  | 0 | 4  | 3  | to | 0 | 4  | 6  |
| Benzidine, base .....               | lb.  | 0 | 6  | 0  | to | 0 | 6  | 6  |
| Benzidine, sulphate .....           | lb.  | 0 | 6  | 6  | to | 0 | 7  | 0  |
| Benzoic acid .....                  | lb.  | 0 | 2  | 0  | to | 0 | 2  | 3  |
| Benzoate of soda .....              | lb.  | 0 | 2  | 0  | to | 0 | 2  | 3  |
| Benzyl chloride, technical .....    | lb.  | 0 | 2  | 0  | to | 0 | 2  | 3  |
| Betanaphthol benzoate.....          | lb.  | 0 | 6  | 9  | to | 0 | 7  | 0  |
| Betanaphthol .....                  | lb.  | 0 | 2  | 3  | to | 0 | 2  | 6  |
| Betanaphthylamine, technical.....   | lb.  | 0 | 9  | 0  | to | 0 | 9  | 6  |
| Croceine Acid, 100% basis .....     | lb.  | 0 | 4  | 6  | to | 0 | 5  | 0  |
| Dichlorobenzol .....                | lb.  | 0 | 0  | 9  | to | 0 | 0  | 10 |
| Diethylaniline.....                 | lb.  | 0 | 6  | 9  | to | 0 | 7  | 6  |
| Dinitrobenzol .....                 | lb.  | 0 | 1  | 5  | to | 0 | 1  | 6  |
| Dinitrochlorbenzol .....            | lb.  | 0 | 1  | 5  | to | 0 | 1  | 6  |
| Dinitronaphthalene .....            | lb.  | 0 | 1  | 6  | to | 0 | 1  | 8  |
| Dinitrotoluenol .....               | lb.  | 0 | 1  | 8  | to | 0 | 1  | 9  |
| Dinitrophenol.....                  | lb.  | 0 | 2  | 9  | to | 0 | 3  | 0  |
| Dimethylaniline .....               | lb.  | 0 | 3  | 9  | to | 0 | 4  | 0  |
| Diphenylamine.....                  | lb.  | 0 | 4  | 6  | to | 0 | 4  | 9  |
| H-Acid .....                        | lb.  | 0 | 8  | 0  | to | 0 | 8  | 6  |
| Metaphenylenediamine .....          | lb.  | 0 | 5  | 6  | to | 0 | 5  | 9  |
| Monochlorobenzol .....              | lb.  | 0 | 0  | 10 | to | 0 | 1  | 0  |
| Metanilic Acid .....                | lb.  | 0 | 6  | 6  | to | 0 | 7  | 0  |
| Monosulphonic Acid (2:7).....       | lb.  | 0 | 7  | 0  | to | 0 | 7  | 6  |
| Naphthionic acid, crude .....       | lb.  | 0 | 4  | 0  | to | 0 | 4  | 3  |
| Naphthionate of Soda.....           | lb.  | 0 | 4  | 3  | to | 0 | 4  | 6  |
| Naphthylamin-di-sulphonic-acid...   | lb.  | 0 | 4  | 9  | to | 0 | 5  | 0  |
| Nitronaphthalene .....              | lb.  | 0 | 1  | 4  | to | 0 | 1  | 5  |
| Nitrotoluenol .....                 | lb.  | 0 | 1  | 3  | to | 0 | 1  | 4  |
| Orthoamidophenol, base.....         | lb.  | 0 | 18 | 0  | to | 1 | 0  | 0  |
| Orthodichlorobenzol .....           | lb.  | 0 | 1  | 1  | to | 0 | 1  | 2  |
| Orthotoluidine .....                | lb.  | 0 | 2  | 3  | to | 0 | 2  | 6  |
| Orthonitrotoluenol.....             | lb.  | 0 | 0  | 10 | to | 0 | 1  | 0  |
| Para-amidophenol, base .....        | lb.  | 0 | 12 | 0  | to | 0 | 12 | 6  |
| Para-amidophenol, hydrochlor .....  | lb.  | 0 | 12 | 6  | to | 0 | 13 | 0  |
| Paradichlorobenzol .....            | lb.  | 0 | 0  | 7  | to | 0 | 0  | 8  |
| Paranitraniline .....               | lb.  | 0 | 4  | 6  | to | 0 | 4  | 9  |
| Paranitrophenol .....               | lb.  | 0 | 2  | 9  | to | 0 | 3  | 0  |
| Paranitrotoluenol .....             | lb.  | 0 | 5  | 9  | to | 0 | 6  | 0  |
| Paraphenylenediamine, distilled ... | lb.  | 0 | 12 | 0  | to | 0 | 13 | 0  |
| Paratoluidine .....                 | lb.  | 0 | 7  | 0  | to | 0 | 7  | 6  |
| Phthalic anhydride.....             | lb.  | 0 | 3  | 9  | to | 0 | 4  | 0  |
| Resorcin, technical .....           | lb.  | 0 | 5  | 0  | to | 0 | 5  | 6  |
| Resorcin, pure .....                | lb.  | 0 | 8  | 0  | to | 0 | 8  | 6  |
| Salol .....                         | lb.  | 0 | 2  | 9  | to | 0 | 3  | 0  |
| Sulphanilic acid, crude .....       | lb.  | 0 | 1  | 4  | to | 0 | 1  | 6  |
| Tolidine, base .....                | lb.  | 0 | 6  | 6  | to | 0 | 7  | 6  |
| Tolidine, mixture .....             | lb.  | 0 | 2  | 6  | to | 0 | 2  | 9  |

## Potash Prices

Quotations during the past week have been approximately as follows:—

|                                       |     |    |   |         |    |    |         |
|---------------------------------------|-----|----|---|---------|----|----|---------|
| French kainit, 14 per cent. ....      | £3  | 7  | 6 | to      | £3 | 10 | in bags |
| Sylvinit, 20 per cent. ....           | £4  | 7  | 6 | in bags |    |    |         |
| Sylvinit, 30 per cent. ....           | £6  | 11 | 6 |         |    |    |         |
| Muriate of potash, 50 per cent. ....  | £12 | 6  | 0 |         |    |    |         |
| Sulphate of potash, 90 per cent. .... |     |    |   |         |    |    |         |
| purity .....                          | £16 | 0  | 0 |         |    |    |         |

F.O.R. London.

## Company News

**F. STEINER & CO., LTD.**—The directors recommend a dividend at the rate of 5 per cent. on the ordinary shares for the year to July 31 last. Meeting, Church Works, Church, September 28, at 12.15 p.m. The ordinary share transfer books are closed from September 21-28 inclusive.

**THORNCLEIFFE COAL DISTILLATION CO.**—The report shows a profit, after allowing for depreciation, E.P.D., and other taxes, of £57,404. Formation expenses and costs of conveyances written off amount to £6,109, and a dividend at the rate of 8 per cent. per annum on the preference shares for the six months to June 30 is declared, leaving to be carried forward £6,895.

**BRITISH CYANIDES.**—The report for the year to April 30 last states that for the half year to October 31, 1920, the net profit amounted to £20,046, to which has to be added £3,983 brought in and £10,422 recovered from excess profits duty on account of 1919, making £34,451; after deducting £15,270 for interim dividends on preference and ordinary shares and £1,004 for directors' percentage, a balance was carried forward of £18,177. During the half-year to April 30, 1921, a loss of £25,100 was made, and a further loss of £52,674 was incurred in writing down stocks to current values, making a total loss of £77,774 and a net loss, after deducting the balance brought in, of £59,598. In order to meet this deficiency the directors recommend the transfer of the balance of repairs and renewals account, amounting to £11,906, and also that the sum of £50,000 shall be taken from reserve, reducing that account to £50,000. These adjustments will result in a credit balance of £2,308, less dividend paid on cumulative preference shares for last half-year at the rate of 5 per cent. per annum, free of tax, leaving to be carried forward £958.

**MAGADI SODA CO., LTD.**—The report for the year 1920 states that the accounts show a debit balance of £159,327. This figure includes £49,342, as provision for depreciation for the year, an item which appears in the accounts for the first time. The operations in Kenya, to the start of which brief allusion was made at the previous annual general meeting, have continued throughout the present year. The directors feel satisfied from the results already obtained from the initial working of the various sections of the plant that the latter is capable of producing soda ash of the finest quality. Shipments are being made in increasing quantities. The plant will soon be fully equipped, and the company will then be in the position of producing and marketing largely augmented quantities of soda ash. In this respect, in order to conform with the wishes of shareholders, the company in April last published a statement in the Press as to the progress of operations up to that date. The directors regret to report that the War Office has definitely refused to recognise the company's claim for compensation for military use of the Magadi Railway and water supply during the war. The annual general meeting will be held at Winchester House on September 26, at 2.30.

**INDO-BURMA OILFIELDS (1920), LTD.**—Subscriptions have been invited for an issue of £250,000 10 per cent. convertible first mortgage debenture stock at par, payable 10 per cent. on application, 40 per cent. on allotment, 25 per cent. on November 30, and 25 per cent. on January 31, 1922. The stock is repayable on June 30, 1924, at 110. Of the stock, £55,000 has been subscribed in India on the terms of the prospectus, and the remaining £195,000 is now offered for subscription. Interest is payable half-yearly on January 1 and July 1 in each year. The stock is secured under a trust deed in favour of the trustees by means of a specific mortgage on the oil-mining properties and fixed plant, and a floating charge on the remaining assets and undertaking of the company. The company has an authorised capital of £2,000,000, in ordinary shares of £1 each, of which £1,440,000 has been issued and £60,000 agreed to be issued. The property and assets of the company stand in the books at a total of £1,557,942. The company's liability to one of its bankers amounts to £29,700, and in addition there are contingent liabilities amounting to £67,200. Applications must be lodged with the company's bankers, Barclays Bank, Ltd., 54, Lombard Street, E.C., and branches; London Joint City and Midland Bank, Ltd., Threadneedle Street and branches; and Cox and Co., Calcutta. Preferential consideration in allotment will be given to shareholders of the company. The list will close on or before September 26.

## Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

| LOCALITY OF FIRM OR AGENT. | MATERIALS.                            | REF. NO. |
|----------------------------|---------------------------------------|----------|
| San Francisco              | Heavy Chemicals: laboratory apparatus | 241      |
| Sydney ...                 | Heavy chemicals ...                   | 245      |
| Toronto ...                | Heavy chemicals ...                   | 246      |
| Paris ...                  | Paints, colours, varnishes            | 255      |
| San Francisco              | Caustic soda, soda ash                | 271      |
| San Francisco              | Laboratory supplies                   | 277      |
| Chile ...                  | Drugs, &c.                            | 246      |

## Tariff Changes

**BRITISH INDIA.**—An official notification dated August 11 contains a ruling of the Governor-General-in-Council to the effect that, when indigo paste produced in India is exported therefrom, the cess of one rupee per maund of 82 2/7th pounds avoirdupois (as prescribed by the Indigo Cess Act, 1918) shall be levied on one-third of the total weight of such paste.

**FRANCE.**—As from September 6 the prohibition on the export and re-export from France of petroleum, schist and other mineral illuminating oils, and spirit, heavy oils, and residues of petroleum and other mineral oils, is removed.

**ITALY.**—The following goods may now be exported without the requirement of an export licence:—antimoniferous lead scrap; lime, residue from the purification of illuminating gas; lubricants for machinery derived from non-edible vegetable oils; waste products of maize derived from the manufacture of starch, and waste products from the manufacture of beer, dessicated for cattle food, and in general all products that may be classed as cake.

**PORTUGAL.**—Kaolin is now subject to a surtax of 7 escudos per metric ton when exported in foreign vessels, and 3 escudos per metric ton when exported in Portuguese vessels, instead of the former uniform surtax of 50 per cent. *ad valorem*. All minerals, except tin and tin ore (which shall continue to pay surtaxes of 100 and 200 escudos per metric ton respectively), may now be exported without payment of an export surtax.

**TUNIS.**—The duty on the export of oilcakes from Tunis is now withdrawn.

**NIGERIA.**—As from August 24, import duties on the following articles have been increased as shown below:—Gunpowder, from 1s. to 1s. 3d. per lb.; kerosene, from 3d. to 6d. per gallon; soap, from 3s. to 4s. per cwt.; and matches, from 2s. to 2s. 6d. per gross of boxes.

**DENMARK.**—The exportation of yeast from Denmark has been prohibited, as from August 1, until further notice.

**ESTHONIA.**—The export of platinum is now subject to an *ad valorem* tax of 5 per cent.

**GERMANY.**—Sunflower seeds may be imported without licence as from August 31.

**HUNGARY.**—The Customs import duties on pyrites, mineral oils; lignite and schist tar; and lead, alloyed or not with antimony, arsenic, tin, or zinc, crude, in scrap or waste; and zinc alloyed or not in lead or tin, crude, in scrap or waste, are still suspended.

**MARTINIQUE.**—The Customs import duties on chemical products for matches is increased to 120 francs per 100 kilograms (general tariff) and 100 francs per 100 kilograms (minimum tariff).

**UNITED KINGDOM.**—The Board of Trade (Licensing Section) announces that as from September 8, 1921, an open General Licence has been issued permitting the export of sulphate of ammonia, and of compound manures having sulphate of ammonia as the only export-prohibited constituent. Applications need, therefore, no longer be submitted to the Imports and Exports Licensing Section in respect of these commodities.

THE VANILLA CROP of the French Colonies this year is expected to fall short of 350 tons, as against 550 tons in 1920.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

### London Gazette

#### Bankruptcy Information

MOODY, WILLIAM EDMONDSON, residing and carrying on business at 3, Market Place, Driffield, in the East Riding of the County of York, chemist and mineral water manufacturer. Date of receiving order, Sept. 15. Debtor's petition.

#### Company Winding-up Voluntarily

VIVIAN SOAP CO. (ROCHESTER), LTD. Mr. Ernest Layton-Bennett, Chartered Accountant, of 31-32, Broad Street Avenue, Blomfield Street, E.C. 2, appointed liquidator. Meeting of creditors at above address on Wednesday, October 5, at 12 noon.

#### Liquidator's Notice

BRITISH LENS GRINDING CO., LTD. (In voluntary liquidation.)—Meeting of the creditors at the offices of Lord, Foster & Co., Chartered Accountants, 37, Walbrook, London, E.C. 4, on Friday, September 30, at 2.30 p.m.

### Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced since such date.]

BURLINGTON INDUSTRIAL LABORATORIES, LTD.—Reg. September 6, £2,500 debentures; general charge.

NENE VALLEY TANNING CO., LTD., Irthlingborough.—Reg. September 5, mortgage to National Provincial & Union Bank of England, Ltd., securing all monies due or to become due to the Bank; charged on land, tannery, premises, &c., at Irthlingborough. \*Nil. September 12, 1920.

POCHIN (H. D.) & CO., LTD., Salford, manufacturing chemists.—Reg. September 8, mortgage by way of substituted security (supplemental to mortgage reg. June 24, 1919), securing £10,000; charged on leases, &c., of Gunheath & South Cuddledown China Clay Works, St. Austell, and buildings, fixed machinery, &c. \*£17,300. July 22, 1920.

#### Satisfaction

ANGLO-FRENCH DRUG CO., LTD., London, E.C.—Satisfaction reg. September 9, £2,000 reg. Dec. 9, 1919.

### County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

DOWSONS, LTD., Market Place, Colne, chemists. £20 12s. July 28.

SUFFELL, JOHN R., Newburgh, near Wigan, manure contractor. £41 os. 7d. August 3.

BURFORD BROTHERS & CO., 83, London Street, Bethnal Green, vinegar and chemical merchants. £47 19s. 9d. July 30.

SMITH, P. P., 170, Westgate, Bradford, chemist. £21 3s. 4d. July 28.

CAMERON, W. R., 198, Union Road, Oswaldtwistle, chemist. £10 15s. 9d. July 14.

EDWARDS, J. M., 311, Fulham Palace Road, S.W., chemist. £15 5s. 4d. July 13.

POMEROY, FRANCIS T., 5, The Exchange, Thornton Heath, chemist. £21. July 19.

SMITH, P. P., 170, Westgate, Bradford, chemist, £16 15s. 6d. July 18.

WINTERBURN, ALBERT, dyer, and WINTERBURN, MARY (his wife), 152, Priestman Street, Bradford. £10 4s. 4d. July 20.

STAFFORD, LOUIS ARTHUR (and STAFFORD, ELIZABETH, his wife), 14, Brodley Mills, Huddersfield, chemical manufacturer. £11 5s. 4d. August 3.

LLEWELLYN, W., 135, Dunraven Street, Tonypandy, chemist. £13 17s. 11d. August 3.

### New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

CARR & CO. (HULL), LTD. Exporters, importers and factors of coal, coke, patent fuel and by-products of coal, &c. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: L. Carr, 19, Clifton Crescent, South Rotherham; Mrs. F. Carr, 19, Clifton Crescent, South Rotherham.

COLIN CAMPBELL & CO. (LONDON), LTD., 70/71, Chiswell Street, E.C.1. Glass merchants. Nominal capital, £10,000 in 10,000 ordinary shares of £1 each. Subscribers: S. Bicheller, 19, Frogna Lane, Hampstead, N.W.; C. M. Campbell, The Lawn, Caterham, Surrey.

ANGLO-ORIENTAL PETROLEUM COMPANY, LTD. To acquire lands, mines, minerals, petroleum, oil shale or other substances and turn same to account. Nominal capital, £100 in 100 shares of £1 each. Directors to be appointed by subscribers. Subscriber: A. E. Gliddon, 65, Belgrave Road, Walthamstow, E.17.

INDUSTRIAL SOAP CO., LTD. To carry on the business of manufacturers and dealers in soap, oils and oleaginous and saponaceous substances. Nominal capital, £10,000 in 10,000 shares of £1 each. Directors to be appointed by subscribers. Qualification of directors, £100. Subscribers: W. Nichol, 2, Victoria Road, Levenshulme; C. Miller, 41, Albert Road, Levenshulme; J. Miller, Green Mount, 220A, Plymouth Grove, Chorlton-on-Medlock; F. Bridge, Smithfield Market, Manchester; G. Marsdenam, 8, Market Street, Warrington; H. W. Billam, 7, St. John Street, Manchester.

PASTEX DYES, LTD., Cromwell House, Surrey Street, Strand, W.C. Manufacturers of and dealers in dyeing materials, chemicals, colours, &c. Nominal capital, £20,000 in 20,000 ordinary shares of £1 each. Directors: A. J. Willis, 8, Coburg Mansions, Russell Square, W.C.1.; E. C. Davies, "Hughenden," The Embankment, Bedford; A. E. Willis, 8, Coburg Mansions, Russell Square, W.C.1.

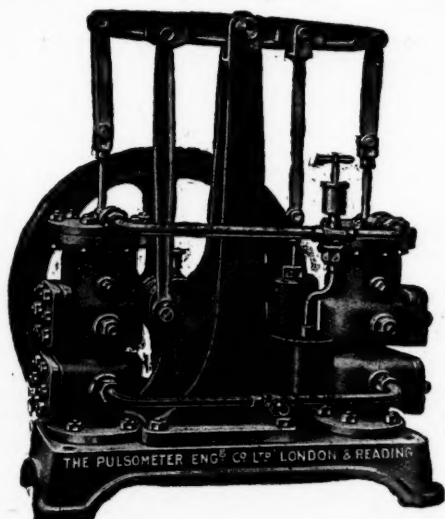
RUBBER SHAREHOLDERS' ASSOCIATION, LTD.—Reg. September 17, 1921. To consider and provide means for the study, consideration and discussion of, and to organise opinion, on all or any questions relating to the rubber-growing industry, and to tropical agriculture in all its branches, or in any way affecting the interests of shareholders in plantation companies. Every member to contribute a sum not exceeding 1s. if necessary. A subscriber: R. W. Jones, 3/4, Great Winchester Street, E.C. (Stockbroker).

DYNAZONE, LTD. To acquire from Clement Scott all his rights, title and interest of and in the proprietary preparation known as Dynazone, and to carry on the business of manufacturers and dealers in proprietary articles, druggists and chemists. Nominal capital, £2,000 in 2,000 shares of £1 each. Directors: J. E. H. Kirkwood, 49, Leinster Gardens, Hyde Park, W.; (Mrs.) Eliza Greenham, 20, Doneraile Street, Fulham, S.W.



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# TRADE GUIDE

CHEMICAL AGE

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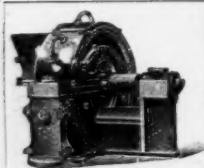
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**Oertling**  
LONDON



## Chemical Plant

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LONDON, E.C.4.



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THE Trade Guide is a compact and handy form of reference to a representative list of firms engaged in various branches of the Industry. In most cases fuller particulars may be found by referring to the displayed advertisement elsewhere.

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30 Times adsorptive capacity of bone char.  
In five grades.

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